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Plant Industry

PROJECT RESULTS
1991

Field Crops/Horticultural Crops

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FOREWORD

These Project Reports are primarily a result of research and demonstration projects conducted by personnel in the Plant Industry Branch, Nova Scotia Department of Agriculture and Marketing. Many were conducted jointly with Soil and Crop Improvement Associations or with Agriculture Canada personnel and several were primarily grower projects. These reports will be of interest to farmers, Department staff and agri-business personnel who wish to improve crop production in Nova Scotia.

We would like to thank our Agricultural Technicians John Arnold, Kim Best, Arthur Haskins, Andrew King, Alden Knight, Keith Silver, and Charles Surette for their dedicated work on many of these projects. We also wish to thank our summer student assistants, SCIA, Agriculture Canada and grower co-operators.

All assistance from the Canada/Nova Scotia Livestock Feed Initiative, the Canada/Nova Scotia Agri-Food Development Agreement, the Department of Agriculture and Marketing Research Fund and agri-business is gratefully acknowledged.

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LOWBUSH BLUEBERRY INSECT SURVEY 1991

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Abstract

A sweepnet survey was conducted on a weekly basis to monitor insect populations in lowbush blueberry fields. Thirty-five growers participated, and 315 fields were sampled. Twenty-seven fields had pest populations which required control measures. A survey of 21 fields for blueberry leaftier was conducted. The results showed very low levels of leaftiers in all fields. Two species of Geometrids, closely related to the blueberry spanworm were found in several fields. This program was very successful in alerting growers to the presence of insect pests in their fields.

INTRODUCTION: The blueberry insect survey is an annual program conducted in cooperation with lowbush blueberry growers, to monitor leaf feeding insect populations in blueberry fields. The results of the survey are compiled on a weekly basis. Growers are alerted to possible insect outbreaks, and can therefore prevent damage to their crop.

This years sweepnet survey had participation from 35 growers, and sampled a total of 315 fields. This represents a decrease in participation, and an increase in coverage from 1990 when 42 growers and 297 fields were included in the survey. A survey for blueberry leaftier was also conducted.

MATERIALS AND METHODS: Participating growers were asked to take weekly samples, using a standard 30 cm sweepnet, from each of their fields. Three samples of 25 sweeps each were taken in each field. The samples were placed in one-litre plastic containers, which were supplied by the Plant Industry Branch. These samples were picked up once a week at designated pickup points, by a student hired to sort and identify the insects in the samples.

Results of the survey were mailed to the grower on a weekly basis. If any potential problems were indicated by the results, the grower was contacted by phone as soon as possible.

The survey lasted for the ten week period of May 13 to July 19, 1991.

The bluberry leaftier survey was conducted in 21 fields in the Diligent River area of Cumberland County. This area has had the only major outbreak of blueberry leaftier in the province. The population had declined in 1990, and a survey was done to determine population levels for 1991.

The blueberry leaftier cannot be sampled effectively by sweepnet in its early stages, since the caterpillars are either concealed in the fruitbuds of the blueberry, or in the leaves which they tie together with silk. Rather, blueberry stems are cut and their fruitbuds examined under a steriomicroscope for the presence of leaftier larvae. Three 100 bud sub-samples are examined from each field on each sampling date. Bud samples were collected on three occasions, April 26, April 30, and May 9, 1991. Two fields were sampled on May 9th only.

RESULTS AND DISCUSSION: The number of fields sampled each week in the sweepnet survey was variable. Of the 315 fields that were sampled, 151 or 48% were sampled on a regular basis; 30 or 9.5% were sampled more or less regularly (3–4 times) and 134 or 42.5% were sampled only once or twice. The majority of the fields in the last category were fields that were sampled for blueberry case beetle in July. This group included a number of sprout fields.

The distribution of fields by county is as follows: Antigonish–17; Colchester–65; Cumberland 132; Halifax–22; Hants–12; Pictou–67.

The total number of fields with insect populations which required control measeures was 27, or 8.5%. The data for each species of pest is listed in Table 1.

Table 1: Results of the Blueberry Insect Sweepnet Survey

	Number of Fields Requiring Control		
Insect	1989	1990	1991
Blueberry Flea Beetle	4	2	10
Blueberry Leaf Beetle	3	8	3
Blueberry Case Beetle	29	7	4
Blueberry Spanworm	5	3	8
Blueberry Sawfly	1	7	2
Total	**42**	**27**	**27**
Total Fields Sampled	241	297	315

Table 2: Blueberry Leaftier Survey Results

Sample Date	No. of Fields Sampled	<5% Infestation	>5% Infestation
April 26	19	19	0
April 30	19	19	0
May 9	15	15	0

The results of the leaftier survey are shown in Table 2. None of the fields sampled required treatment for this insect. One other field in the Fenwick area was sampled for leaftier, with similar results.

In addition to the insects already discussed, two species of spanworm, closely related to the blueberry spanworm were found in signifigant numbers in three fields. Blueberry spanworm was also found in the same fields so these infestations are included in the number recorded in Table 1.

The two species were identified as *Itame brunneata* (Thunberg) and *Itame andersoni* (Swet), Lepidoptera: Geometridae. They are in the same genus as the blueberry spanworm, *Itame argillacearia* (Packard). Their status as a pest is not known at this time. They will be considered in combination with blueberry spanworm in next years survey.

CONCLUSION: While the number of growers participating decreased over last year, the

number of fields sampled increased by about 6%. Insect infestations which required control measures were detected in 27 fields. This is the same as for the previous growing season. Leaftier levels remained low this year, and very few if any fields received sprays for this insect.

This program has been quite succesful in helping blueberry growers reduce crop losses from insect activity. This program will be available to blueberry growers again in 1992.

ACKNOWLEDGEMENTS: I would like to thank all of the growers who participated in the program. I would like to especially acknowldge Michelle Ralph for her diligent effort in collecting and sorting the numerous samples. I would also like to thank Dr. P.Dixon, and Mr. A. Knowlton for their help in having the *Itame* larvae identified.

IRRIGATION OF LOWBUSH BLUEBERRIES

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Abstract

Irrigation was applied during the growing season to lowbush blueberry fields in 3 areas of Nova Scotia. Results after 1 growing season show that growth was increased during the vegetative year, but yields during the crop year were not increased.

INTRODUCTION: Yields of lowbush blueberries from many fields in Nova Scotia have been increasing over the past several years. However, in some areas of the Province, yield increases have lagged behind.

Some blueberry land in Maine has been irrigated for several years with favourable results. In 1990, yields in a blueberry field in Nova Scotia were increased by 45% with the use of irrigation.

These results, together with the knowledge that growers are looking for ways to increase yields and thus efficiency, prompted this formal project to find out if irrigation does indeed increase yields, if irrigation is economically feasible, and to assess effects of irrigation on the vegetative growth and fruit growth of lowbush blueberries.

MATERIALS AND METHODS: Irrigation was applied during the growing season to lowbush blueberry fields in 3 areas of Nova Scotia. In one case, a travelling overhead gun was used. In 2 cases, solid set systems with sprinklers were used. Irrigation was applied to both sprout (1st year) fields and crop (2nd year) fields. The systems were used to bring weekly waterfall to a minimum of 30 mm.

RESULTS: Vegetative (1st year) growth was increased by regular irrigation to supplement rainfall during the growing season. Yields from irrigated sections of crop (2nd year) fields were no higher than from non- irrigated sections. These results perhaps may be explained by the fact that there was a drought period during June and most of July, followed by regular and plentiful rainfall from late-July to harvest.

CONCLUSIONS: Results indicate that sufficient waterfall during the 3 week period prior to harvest is critical for good yields of lowbush blueberries. A considerable cost saving will be realized if growers need only apply irrigation during this period to supplement rainfall and not during the earlier weeks.

As part of this project, irrigation will be applied to a total of 6 sites in 1992. Weekly waterfall will be brought to a minimum of 30 mm on both vegetative and crop fields. Climatic conditions, soil moisture levels and plant leaf transpiration levels will be monitored. Vegetative growth will be measured and yields of fresh fruit will be measured. Fruit samples will be analyzed for quality.

ACKNOWLEDGEMENTS: We would like to thank the Canada/Nova Scotia Agri- Food Development Agreement for funding; the Blueberry Producers' Association of Nova Scotia for acting as applicant; the N.S. Blueberry Institute and Andrew King for equipment and labour; Gerard MacDonald, Extension Engineering Technician; and Aubrey Atkinson, Bragg Lumber Company and Doug Sutherland, blueberry growers who supplied equipment, labour and fields.

LOWBUSH BLUEBERRY INJURY AT VARIOUS HEXAZINONE RATES

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Abstract

The herbicide hexazinone was applied to a pruned (mowed) lowbush blueberry field. The application rates used were from 125 gm ai/ha – 4000 gm ai/ha. No significant differences were observed in stem number, branch number or flower number regardless of hexazinone rates. However, bud numbers did decrease with higher rates of hexazinone. Crop injury increased with the increase of hexazinone rates. This was evident by the degree of defoliation and stem senescence observed. The lowest rate of hexazinone (125 gm ai/ha) did not appear to injure the crop as did the other rates at varying degrees. Injury increased as the hexazinone increased.

INTRODUCTION: Hexazinone has offered very effective chemical weed control in lowbush blueberries in Nova Scotia. However, some crop injury has been observed by producers and specialists, which resembles that of chemical injury (i.e. defoliation, tip burn, stem senescence).

This trial was performed to identify and evaluate levels of blueberry crop injury at rates of hexazinone ranging from below to above recommended rates.

MATERIALS AND METHODS: The location of this trial was a pruned (mowed) lowbush blueberry field in East Gore, Hants County. The field was relatively free from weeds and the crop was in full foliage.

Plot size was 2 m x 5 m with 4 replications. Experimental design was a complete randomized block.

Hexazinone treatments were applied June 7, 1991 using a hand–held $C0_2$ sprayer. Water volume was 200 *l*/ha at 240 kpa pressure. Hexazinone rates were between 125 gm ai/ha and 4000 gm ai/ha (Table 1). Crop injury ratings were recorded July 15, 1991. Injury was identified as defoliation and stem senescence.

Plant samples were obtained the first week of November 1991. Sampling consisted of clipping all the blueberry plants in 0.1 m^2 area. Three samples were taken from each plot. The number of stems, branches and buds were recorded per sample and statistically analysed.

DISCUSSION AND RESULTS: No significant differences were found in number of stems, branches or buds. Although, a trend of decreasing bud numbers was noted with the increments of hexazinone rates.

No crop injury was observed at the lowest hexazinone rate (125 gm ai/ha). Crop injury ranged from slight to moderate defoliation with hexazinone rates of 250 gm ai/ha to 1000 gm ai/ha. Rates of 1500–2000 gm ai/ha caused severe injury with almost complete defoliation and some stem senescence.

CONCLUSION: The recommended application rates for hexazinone are 1500– 2000 gm ai/ha. The results indicate approximately 45% crop injury at 1500 gm ai/ha and 82% crop injury at 2000 gm ai/ha.

The lack of correlation between visual injury and the relatively constant stem and branch number suggests recovery of the crop from chemical injury. Therefore, a crop reduction may not result. These findings suggest more testing should be done to re–evaluate recommended rates.

Table 1: Results from Velpar applied at various rates to blueberries.

Treatment	Rate	# Stems	# Branches	# Buds	% Injury
Control	–	60	122	132	0
Hexazinone	125	56	141	144	0
Hexazinone	250	64	144	116	12
Hexazinone	500	43	94	121	30
Hexazinone	1000	62	147	100	25
Hexazinone	1500	62	151	129	45
Hexazinone	2000	65	182	94	82
Hexazinone	4000	51	142	83	77
LSD 0.05		NS	NS	NS	30

DEVELOPMENT AND EVALUATION OF A SAMPLING METHOD AND EARLY SEASON TREATMENT THRESHOLDS FOR EUROPEAN RED MITE, *Panonychus ulmi*, WINTER EGGS ON APPLE TREES

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Abstract

A simple and fast sampling method that produces quantitative results was developed for winter eggs of the European red mite (ERM), Panonychus ulmi. Thresholds for determining which control options to use were also established and evaluated. It was found that the sampling method produced reliable results that could be compared to thresholds and that the thresholds were acceptable. Superior oil (70 sec) proved to be a very effective and environmentally friendly control option even for high populations of ERM winter eggs.

INTRODUCTION: European red mite (ERM), Panonychus ulmi, can be a serious pest in Nova Scotia apple orchards and it is very difficult to control. Growers sometimes apply as many as three miticides in a single year and many have to apply at least one post-bloom miticide on an annual basis. These sprays are very expensive, and are often not very effective. Part of the reason for poor control success is the fact that ERM has 4–5 generations per season in Nova Scotia and can undergo a several hundred fold population change during that time. Once a population starts increasing rapidly, even products that provide high levels of kill in single applications cannot prevent resurgence without multiple treatments. Preliminary observations seem to indicate that early season mite control can reduce the occurrence of mite problems later in the season. Control measures can be applied against winter eggs from late April to middle May. However, reliable and accurate methods for assessing ERM winter eggs were lacking so making a control decision early was often difficult, especially when mite eggs were not blatantly obvious on the trees. Also, there were no thresholds established for determining which of several available early season control strategies should be used. Therefore, a method for assessing ERM winter eggs was developed and thresholds for early season treatment were established. An evaluation of the assessment method and thresholds was conducted.

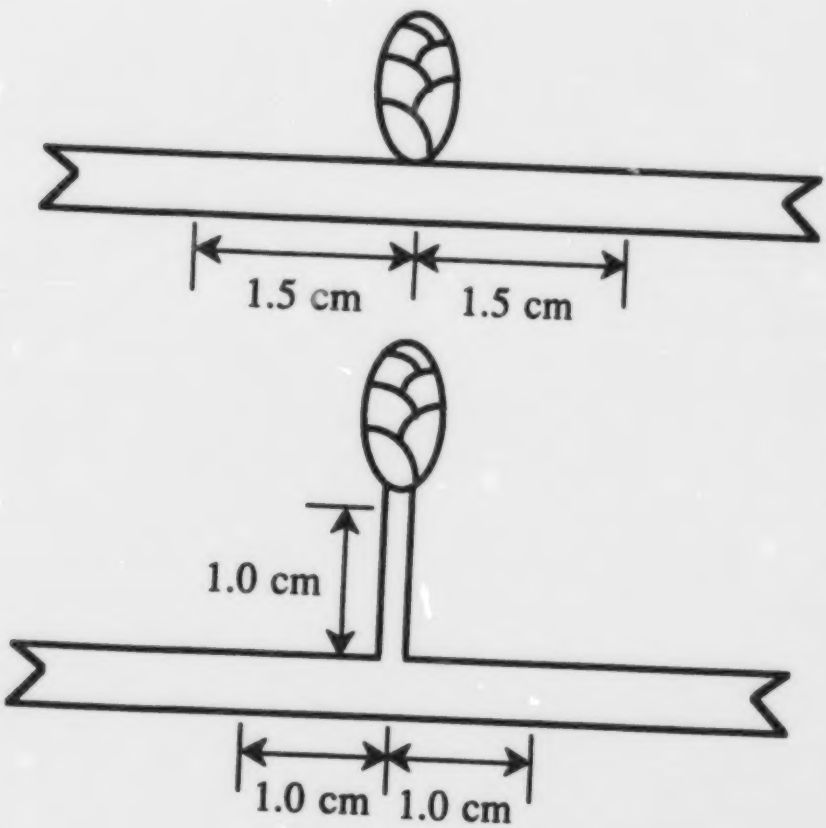
MATERIALS AND METHODS: The criteria for developing a useful assessment method were as follows:

1. The sample unit must be well defined and easily identified.
2. The method must allow quick assessment in the field.
3. The result must be accurate enough to determine levels of abundance that can be related to treatment thresholds.

Sample unit

The sample unit was defined to be the equivalent of 3 cm of wood around a spur or bud from at least two year old wood of <2 cm in diameter (Figure 1). This unit will henceforth be referred to as a spur.

Figure 1: The sample unit used for assessing European red mite winter eggs on apple trees.



Sample size

One sample consisted of 10 spurs from each of 3–10 trees.

Assessment of winter egg abundance

A scoring of the abundance of winter eggs on 3 cm of spur wood was based on a 5 point scale of abundance from 0–4 (Table 1). Spurs were examined on the trees to avoid time consuming collection and laboratory analysis.

The scores for each spur in a sample were tallied and the average score was calculated by dividing the total tally by the number of spurs examined.

Thresholds

It was assumed that Superior oil concentrate is effective where mite pressure is low, Superior oil (70 sec) is effective for all populations except possibly very high populations, and Apollo should be used on very high populations. Therefore, three arbitrary thresholds were established (Table 2) that could be related to the scoring system proposed.

RESULTS AND DISCUSSION:

The sampling method described was used in the nine orchard blocks that are involved in an Intensive IPM Pilot Project (Rogers, unpublished) and was found to be simple, fast, and produced reliable quantitative results. The consulting firm, Agricultural Pest Monitoring (APM), also tried the new sampling method for winter egg surveys in commercial apple orchards and reported that it was acceptable and would be adopted for all future surveys.

The average ERM winter egg scores from nine orchards are summarized in Table 3 along with mite leaf counts from June, July, and August, and mite controls applied for the same months. Figure 2 graphically illustrates the number of orchards that were over the various thresholds that were established.

Regression analysis of winter egg scores and mite counts on leaves in June suggests that egg scores may be a good predictor of post-bloom mite populations (Figure 3). The correlation, however, should be tested further after increasing the number of orchards sampled.

CONCLUSIONS: The sampling method developed here appears to be a significant improvement and refinement over methods tried elsewhere in North America. The sample unit is well defined and the results are comparable from one orchard to another as long as the per-

Table 1: A five point scale for scoring European red mite winter egg abundance on spurs of apple trees.

SCORE	NUMBER OF EGGS
0	0
1	1–10
2	11–50
3	51–100
4	>100

Figure 2: ERM winter egg survey results and thresholds in intensive IPM orchards, 1991.

Figure 2. European red mite winter egg survey results and thresholds in intensive IPM orchards, 1991.

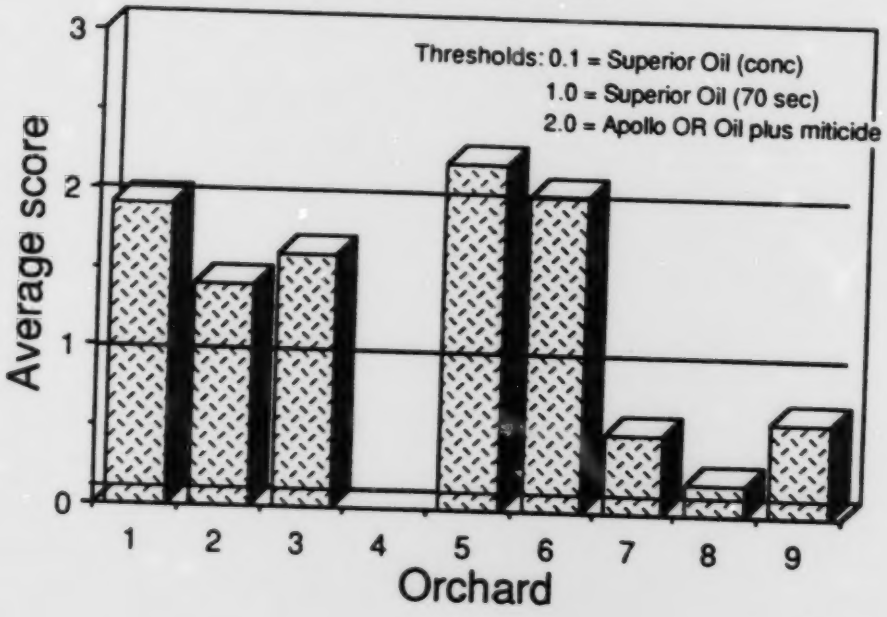
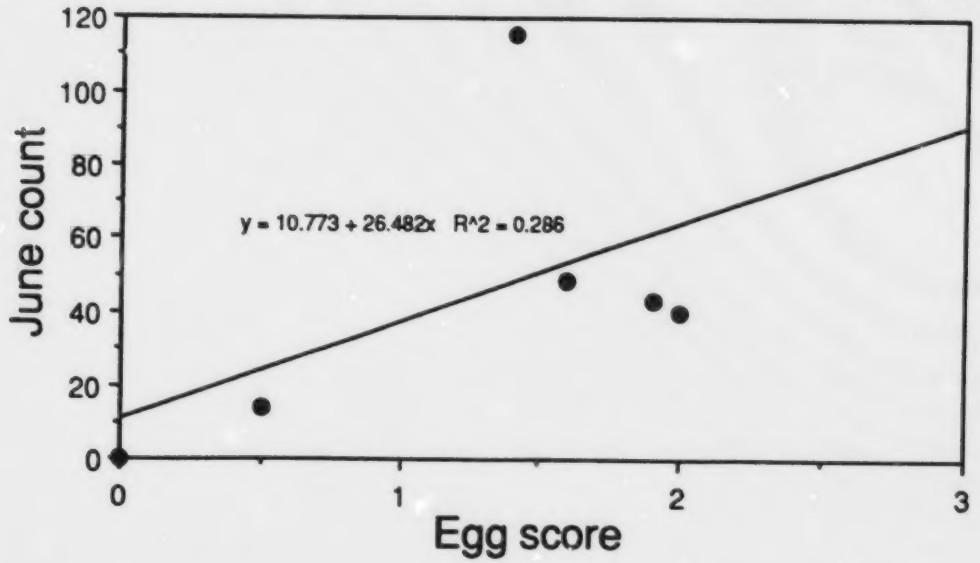


Figure 3: Simple linear regression analysis of ERM winter egg scores and June counts of mites on leaves from intensive IPM orchards where no oil was used, 1991.

Figure 3. Simple linear regression analysis of European red mite winter egg scores and June counts of mites on leaves from intensive IPM orchards where no oil was used, 1991.



sons sampling have some training and experience. Therefore, growers should be able to learn and practice this method and thereby be able to make better control decisions and achieve maximum benefit from consultant and extension staff consultations.

The thresholds were established somewhat arbitrarily, but were based on many years of experienced observation, and published comments from other areas of North America. Ultimately, the preliminary thresholds were found to be quite acceptable and will continue to be used until further information becomes available that supports the need for adjustments.

In addition to developing a useful sampling method and adequate thresholds, this project provided supporting evidence that Superior oil (70 sec) is very effective for early season mite control if used at the 15 mm to tight cluster stage of bud development, even when high numbers of ERM winter eggs are present.

Acknowledgements: This project was made possible because of cooperation from grower participants, David Bowlby, the Nova Scotia Fruit Growers Association, Agricultural Pest Monitoring, Dr. Robert Smith and Dr. Mike Hardman.

Table 2: Treatment thresholds for European red mite winter eggs based on average score of abundance.

THRESHOLD	RECOMMENDATION	EXAMPLE ERM EGG POPULATION
0	No treatment	0% of spurs with eggs
0.1	Superior oil (conc)	10% of spurs with 1–10 eggs
1.0	Superior oil (70 sec)	100% of spurs with 1–10 eggs
2.0	Apollo (at calyx)	100% of spurs with 11–50 eggs

Table 3: Average ERM winter egg scores, mite counts for three periods, and mite controls applied in nine intensive IPM orchards, 1991.

ORCHARD NUMBER	EGG SCORE	OIL USED	ERM/LEAF JUNE	JUNE CONTROL	ERM/LEAF JULY	JULY CONTROL	ERM/LEAF AUGUST	AUGUST CONTROL
1	1.9	N	43.2	Apollo	0.4	-	2.6	-
2	1.1	N	115.4	Apollo	6.8	-	1.6	-
3	1.6	N	48.2	Apollo	11.0	Omite	3.0	-
4	0.0	N	0.2	-	0.0	-	0.0	-
5	2.2	Y	0.4	-	9.2	-	4.0	-
6	2.0	N	40.0	Apollo	7.0	-	0.8	-
7	0.5	N	13.6	-	30.6	-	1.2	-
8	0.2	Y	3.8	-	0.0	-	0.0	-
9	0.6	Y	2.4	-	4.0	-	3.0	-

STRAWBERRY IPM PROGRAM 1991

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Abstract

The results from the second year of the strawbery monitoring program are reported. Seven fields belonging to six growers in Colchester and Pictou Counties were involved. Fields were scouted twice weekly for insects and diseases. A comparison of scouted fields versus regular management showed very little difference in marketable yield or fruit quality. There was also little difference in the number of pesticide applications made. Residue analysis of berries from two fields showed no significant pesticide residues on berries from either management scheme. It is concluded that monitoring of strawberry fields is valuable in detecting arthropod pests, and in increasing the accuracy of timing pesticide applications. It is recommended that this program be expanded for the remaining two years of the project.

INTRODUCTION: This pest and disease monitoring program was implemented in 1990, under the Canada/Nova Scotia Technology Introduction and Evaluation Program. The project was initiated and administrated by the Strawberry Growers Association of Nova Scotia.

The Purpose of the project is to develop and implement a pest monitoring system for Nova Scotia strawberry growers. Through the use of this program growers should be able to make better pest management decisions. Information provided by the scout could result in better control results through more accurate timing of spray applications.

The first two years of the program involved six growers, three from Colchester County, and three from Pictou County. Each grower provided one field of strawberries, which was monitored by a scout for various pest and disease problems.

This report presents the results of the second year of the program.

MATERIALS AND METHODS: First or second year fruiting fields with a single variety of strawberries were selected. Each field was divided in half. One half of the field was monitored for pests and diseases. Treatments for control were applied based on the findings of the scout. The other half of the field was treated under the normal management practices of the grower. This year, one grower provided two fields, so that the total number of fields was seven.

The fields were visited twice each week from the middle of May to the first week of July. A copy of the scouts findings was left in a designated location with each grower, after each visit. The fields were also visited on occasion by the project leaders.

In order to improve upon the scouting report used during the first year of the project, a phenology table for strawberry was developed. It consisted of a scale from one to eleven, which was based on bud development, and maturity of the fruit. This table was distributed to each grower. The stage of development was determined by the scout on each visit, and recorded on the scouting report.

A series of pest profiles were also prepared for each pest or disease monitored by the scout. These profiles contained descriptions of the pest or damage symptoms, pertinent biological information, as well as information about action thresholds if available.

Initially, each field was staked into its two halves. Also, five one metre plots were randomly

selected and marked on each half of the field. These plots were later used to gather yield data.

Soil samples were taken from each field and later in the season, leaf samples were taken and submitted for tissue analysis. Interpretation and discussion of the results with each grower was done by Mr. Robert Murray.

Two species of insects, the strawberry weevil, *Anthonomus signatus* Say; and the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), were monitored.

Strawberry weevils were monitored by counting the number of newly clipped buds in a 30x60 cm. area of row. A wire frame was placed at random in the field, and the number of damaged buds was recorded. Five samples per field were taken.

In fields that were in the second year or more of fruiting, an application of insecticide was recommended when damage was first detected. The second application was made when the threshold of 1.3 clipped buds per frame was reached.

Tarnished plant bugs were monitored by tapping randomly selected bud clusters into a white, plastic container. The number of tarnished plant bug nymphs was recorded. Thirty bud clusters per field were sampled. The action threshold used was 0.5 nymphs per cluster.

Twospotted spider mite, *Tetranychus urticae* Koch, were also monitored. Sixty leaves per field were examined for the presence of mites. The action threshold of 25% of the leaves with active stages of the mite present, was used. Mite samples were collected once per week.

A survey for red stele disease, *Phytophthora fragariae* Hickman, was carried out in early May.

Fungicide sprays for Botrytis fruit rot, *Botrytis cinerea* Pers.ex Fr., were applied at stage 5 of the phenology table. This represented 10% bloom and was determined when 50% of the king blossoms were open. A second application was applied 7 days later, weather permitting.

Other diseases were noted if present and recorded on the report form.

A weed survey was taken early in May, and again in August. Major weed species were noted and recommendations for control were made where appropriate. Weed counts were made by walking diagonally across the field, and noting the species of weeds that were present. If a weed problem was evident, then four to seven one metre quadrats were sampled, and the number of each species was recorded. The weed survey was done under the supervision of Dr. Doug Doohan.

To obtain yield data, the berries from the one metre plots were picked and sorted in the field. The catagories for sorting were; marketable fruit, berries with fruit rot, soft berries, deformed fruit, and other damage. The samples were returned to the laboratory and weighed. At least three pickings were made for each field.

Two fields were selected at random for pesticide residue analysis. Samples of berries from both the IPM plots and the conventional plots were analyzed.

RESULTS AND DISCUSSION: The results of the strawberry weevil monitoring are listed in Table 1. The pattern of weevil development as the season progressed was similar in all fields. All fields received two applications of insecticide. Good control was obtained in all cases.

Tarnished plant bug numbers were very low in all but one field. In this field the counts reached the level of 1.5 nymphs per blossom cluster. The threshold used was 0.5 nymphs per cluster. These numbers occurred quite close to harvest time. Unfortunately the scout was not entirely sure of the identification of tarnished plant bug nymphs. Also there was a lack of

communication at this point between the scout and the project leader. As a result, no sprays were applied to the field, and some damage to the crop occurred (see Table 2, field 2).

Twospotted spider mite levels were low in five of the fields. The threshold of 25% infestation was exceeded in two fields. Those growers were advised to apply a miticide.

Table 1: Strawberry Weevil Damage Counts (average of five samples)

DATE	FIELD 1	FIELD 2	FIELD 3	FIELD 4	FIELD 5	FIELD 6	FIELD 7
May 22-23	0.0	0.0	0.0	0.6	0.0	0.0	0.0
May 27-28	1.4	2.0	2.6	2.0	1.6	1.6	0.8
May 29-30	3.2	1.2	1.0	0.8	3.2	0.8	0.2
Jun 04-05	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 06-07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jun 10-11	0.0	0.0	0.0	1.6	1.8	3.1	1.6
Jun 12-13	1.0	1.0	1.6	1.4	1.4	1.8	1.4
Jun 17-18	0.0	2.0	1.2	0.0	0.0	0.0	0.0
Jun 19-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0

action threshold is 1.3 clipped buds per sample

The survey for red stele disease detected this disease in three fields. The individual growers were notified of the findings.

Botrytis fruit rot levels were fairly low. The results listed in Table 2 show very little difference between the IPM plots and the conventional plots. A few of the growers felt that they had noticed slightly higher levels of fruit rot in the IPM side of the field. Table 3, shows the number of applications of pesticides to each field. Fields 3,4 and 5 received extra sprays for Botrytis control. However, there is very little difference in the levels of fruit rot shown in Table 2.

Other diseases that were monitored included leafspot and powdery mildew. The incidence of these diseases was low throughout most of the season. Two of the growers applied sprays for powdery mildew control.

The results of the weed survey in May indicated the following weed species to be the most prevalent; couch grass, mint, sheep sorrel, stitchwort, creeping buttercup, and toadflax. The August survey showed the following weed species to be prervalent; mint, creeping buttercup, stitchwort, wood sorrel, toadflax, groundsel, lambs quarters, sheep sorrel, couch grass and black medic. The severity of the weed problem ranged from very little problem to severe. This depended on the age of the field and the growers management practices.

The residue analysis of berries from two of the fields showed no detectable levels of insecticides, and very low levels of fungicides present. These were all well below the allowable limits set by the Food and Drug Regulations (see Table 4).

CONCLUSION: The second year of this project ran very smoothly compared to the first year. This can be accredited in part to better preparation by the project leaders, and in part

Table 2: IPM vs.Regular Management – Berry Grades as Percent of Total Weight

FIELD NO.	PLOT	BERRY NO.	TOTAL WEIGHT	MARKET. FRUIT	FRUIT ROT	SOFT BERRIES	DEFORMED FRUIT	OTHER
1	IPM	538.2	4172.2	97.2	0.1	1.5	0.3	0.9
	REG	463.4	3139.9	96.2	0.0	2.4	0.0	1.4
2	IPM	217.8	941.0	80.6	0.3	5.4	10.4[1]	3.3
	REG	199.6	705.8	80.6	0.0	4.7	14.4	0.3
3	IPM	227.4	1075.2	95.0	0.1	1.9	0.1	2.9
	REG	249.6	1156.5	96.4	0.0	1.6	0.3	1.7
4	IPM	445.6	2283.4	82.2	1.5	1.2	0.1	15.0[2]
	REG	388.4	2749.2	88.7	1.1	1.9	0.1	8.2
5	IPM	312.0	2581.8	92.9	2.1	2.6	0.2	2.2
	REG	304.0	2400.1	96.3	0.0	2.2	0.3	1.2
6	IPM	471.6	2306.4	84.1	0.9	14.3	0.0	0.7
	REG	399.6	2054.9	84.7	3.5	11.6	0.0	0.2
7	IPM	448.8	3405.6	94.7	0.0	2.0	0.0	3.3
	REG	385.0	2948.6	96.3	0.0	1.6	0.1	2.0

[1] Tarnished plantbug was abundant [2] Slug damage

Table 3: IPM vs. Regular Management – Number of Pesticide Applications

FIELD NO.	PLOT	INSECTICIDE	FUNGICIDE		MITICIDE
			BOTRYTIS	MILDEW	
1	IPM	1	2	2	1
	REG	NA	NA	NA	NA
2	IPM	1	2	0	0
	REG	1	2	0	0
3	IPM	2	2	0	1
	REG	2	3	0	1
4	IPM	1	2	0	0
	REG	1	3	0	0
5	IPM	1	3	0	0
	REG	1	6	0	0
6	IPM	2	2	1	0
	REG*	2	2	1	0
7	IPM	2	2	1	0
	REG*	2	2	1	O

* Received a spray of Cyprex for leafspot control on May 31

Table 4: Results of Residue Analysis
(figures are in ppm)

FIELD NO.	PLOT	MALATHION	CYPERMETHRIN	CAPTAN	FOLPET
1	IPM	ND[1]	ND	0.05	0.04
	REG	ND	ND	0.05	0.03
7	IPM	ND	ND	0.05	0.01
	REG	ND	ND	0.13	0.02
DET. LIM[2]		0.01	0.02	0.01	0.01
TOL.[3]		8.0	0.2	5.0	25.0

[1] not detected [2] detection limit [3] tolerence level set by Food and Drug Regulations

to the avoidance of errors that were made during the first year.

The scouts performance was very satisfactory. Her background knowledge was very good. This enabled her to learn very quickly to identify the pest or symptoms to look for when scouting the fields. She was very responsible, and worked well without supervision.

The success of this program largely depends on the quality and ability of the scout. Our experience to date has shown that a good background in crop protection is a great asset for the scout.

In both years of the project there was very little difference between the IPM managed plots and the regular management. It does not appear that this program will result in a great reduction of the number of pesticide applications made by strawberry growers. This is due to the fact that most growers are very judicious in their regular management and only apply pesticides when they feel it is necessary.

This program has shown the benefits of monitoring insect and disease in the field. By using this program growers were alerted to the presence of pests in their crop which may have gone unnoticed, or at least developed into a more serious infestation under normal practices.

Based on the results obtained in the first two years of this program, we conclude that there would be very little gained in repeating the project for the remaining two years of the program. We feel that instead, the program should be expanded to include more growers, and to monitor whole fields. There is little value in further comparisons of the two management systems. It is therefore recommended that this program will be expanded to include Cumberland and Hants counties, as well as having a second scout monitor fields in the Annapolis Valley.

ACKNOWLEDGEMENTS: This project is funded under the Technology Intoduction and Evaluation Program of the Canada/Nova Scotia Agri-food Development Agreement. We would

like to thank all of the growers who participated in this program. We would also like to acknowledge Ms. Stephanie Bishop, for her excellent efforts as scout. We would like to thank Mr. Robert Murray for his input into the program, and Dr. Doug Doohan for helping with the weed survey. We also acknowledge the Nova Scotia Pesticide Laboratory for the residue analysis. Finally, we would like to thank Bela Casson for administrating the financial aspects of the project.

POBALTI BRUSH TREE WEEDER – GRAPES

Robert A. Murray, Senior Horticulturist – Berry Crops

Abstract

The original Pobalti brush tree weeder arrived without some of the necessary components. When the machine was placed in service the nylon brushes failed to work effectively. Nylon brushes were replaced with stiff steel cables and the rotational speed was reduced. The results were positive. The modified Pobalti has the potential to replace the use of heavy cultivation and herbicides in a vineyard operation.

INTRODUCTION: Grape growers are investigating methods of weed control which will have a positive impact on the environment, thus eliminating or reducing chemical weed control. A bare ground row is of importance from a management perspective. A bare row retains heat enough to alter the microclime of a vineyard and improve maturity and ripening of the grapes, reduces weed competition and conserves moisture for the vine, reduces the amount of mildew which can be increased by weed–related humidity.

There are several mechanical machines on the market which keep grape vines clean of weeds. The conventional cultivating devices include the Weed Badger and Clements Hoe (both rotary head cultivators) and grape hoes, such as the Green Hoe, which are designed to "hill-in" and "hill-out". Continuous cultivation will result in soil erosion on slopes. The Clements Hoe costs $6100.

The Pobalti brush weeder was developed in Spain to replace steel tined weeder arms. The new plastic brush tree weeder gets up close to trees and vines without doing damage. The objective is to find a "no-till" machine that would "scour" the ground to remove weeds and grass by their roots and keep the earth bare around the trunks.

MATERIALS AND METHODS: The Pobalti brush tree weeder has plastic brushes which are made up of strands 1/4 inch in diameter that spin at 300 rpm's powered by a hydraulic motor. The brushes are to mount on a retractable arm that lifts around trees and vines when necessary.

The Pobalti weeder was purchased for $2,500. It was expected to be shipped from Spain in time for work in late April 1990, but had not cleared customs until May 9.

Further, it was supplied without mounting hardware and lacked mechanisms to control its rotational speed and its movement around trees and vines.

Despite repeated requests, the co–operator received little technical assistance from the supplier in making the weeder operational, so he designed and manufactured the necessary components himself, and hired a local person to assist him and to carry out the work.

RESULTS AND DISCUSSION: When the brush weeder was eventually put into service, several problems were encountered. The grass and weeds were by that time quite mature, and the nylon brushes failed to cut or break them off very effectively. These brushes were much lighter than those pictured in the advertisements, and were occasionally pulled from their mountings after being snarled in weeds or grass stalks.

A large circular blade was mounted on the weeder head, which worked well enough for mature weeds and grass, and most of the vineyard was cleaned up that way.

But the co-operator's original understanding of the implement was that it should be able to scour the ground to remove weeds and grass by the roots. He wanted to have a no-till implement which could keep the earth bare around the trunks, and would therefore be a viable alternative to herbicides.

To this end he replaced the nylon brushes with pieces of stiff, steel cable and reduced the rotational speed. The results of this have been quite positive.

CONCLUSION: Despite initial setbacks, the co-operator says his modified Pobalti has the potential to replace the use of heavy cultivation and herbicides in a vineyard operation.

The complete evaluation of the weeder may take several years. Its use is to maintain bare ground within the row, and to monitor the effects that this has on the vine growth, fruit quality, and the amount of mildew on the canes.

ACKNOWLEDGEMENTS: Appreciation is extended to Canada/Nova Scotia Agri- Food Development Agreement for partial funding under the Technology Introduction and Evaluation program and to Jim McLelland for demonstrating this equipment to the Nova Scotia Grape Growers' Association on their Valley tour on September 27, 1990.

EVALUATION OF FRENCH TUNNELS ON DAYNEUTRAL STRAWBERRIES

Robert A. Murray, Senior Horticulturist – Berry Crops

Abstract

A project was initiated by Terry and Dianne Wenham, Bass River, Colchester County to evaluate the use of French tunnels on dayneutral strawberries to extend the fall strawberry harvest season. The project began in the fall of 1990 and was to conclude by the fall of 1991. A conclusive evaluation on dayneutrals was not possible because of several technical problems. In the fall of 1990 the tunnels lengthened the picking season of Tribute by three weeks. A hurricane on October 18, 1990 and wasp problems in the fruit in the fall of 1991 affected the completion of the project.

INTRODUCTION: Walk–in French Tunnels have been used in Europe to increase a market opportunity for early spring and late fall sale of strawberries. Dayneutral cultivars were evaluated on the Wenham farm under open air conditions during 1988 and 1989. A market for dayneutral strawberries has been established in Halifax. The dayneutral cultivars to be used include Tribute, Selva and Fern. The advantages of using French tunnels with a covering of plastic would be to hold the sun's heat, quicken growth and production of the strawberry plants in the spring so that the fruit might reach the markets at an earlier time; and in the fall, the heat accumulated during the day will be used at night to reduce the chance of blossoms and fruit freezing; to reduce and/or eliminate the use of irrigation for frost protection.

The fourteen foot wide by six foot high tunnels are large enough to allow a small tractor and sprayer to operate and allow workers to work in an upright position. The project was initiated and conducted by Terry and Dianne Wenham, RR#1, Bass River, Colchester County, Nova Scotia B0M 1B0.

MATERIALS AND METHODS: 1990 Season – In mid-May 1990 one half acre planting of Selva (3,000), Tribute (3,000), and Fern (6,000) was established. Plantings were made in double rows with eleven (11) inches between plants on a flat bed. Straw mulch was spread around the plants after planting. All blossoms were picked off for six weeks after planting. All runners were removed. The plants received monthly applications of nitrogen, Harvest Plus 14 –4–6 and ammoniun nitrate. Frequent applications of the insecticide Cymbush were applied for tarnished plant bug and the fungicide Equal was applied for fruit rot. Overhead irrigation was used to maintain adequate moisture. Three French tunnels, 14 feet by 250 feet with 6 foot centre height, using 6 ml duratherm plastic over 1/2 inch round iron pipe were to be established in September 1990 over each cultivar. The plastic supplier was only able to ship plastic for one tunnel due to a back order of Duratherm. This one tunnel was used over the cultivar Tribute. The tunnel was established September 10, 1990. Black iron pipe was driven into the ground which supported the 1/2 inch round iron pipes. Tie down rope was used over the plastic tunnel to prevent wind damage. The sides of the tunnel are able to be raised and lowered for ventilation.

1991 Season – In mid–May 1991 one-half acre planting of Tribute (3,000), Tristar (6,000), and Fern (6,000) was established. The planting system used and treatments applied in 1991 were similar to the 1990 planting.

A decision was made to set up three French tunnels in the spring of 1991 over the June

bearing cultivar Annapolis, as this cultivar was much stronger than the dayneutral cultivars which were planted in 1990.

The first tunnel was established on April 25, the next two tunnels established May 3, 1991. The tunnels covered three rows. These rows were 5'6" apart.

In the fall of 1991 the three French tunnels were to be erected over the three dayneutral cultivars which were planted May 1991. In mid-September an unusual large population of wasps damaged more than 50% of the ripe fruit. It was financially unacceptable to spend additional funds to set up the tunnels. To recover the initial costs of the plastic structures the tunnels will be used in the spring of 1992.

RESULTS AND DISCUSSION: 1990 results – The start up costs for one-half acre of French tunnels is about $8000. The plastic should serve for three years and the pipe for over ten years.

The one plastic tunnel was set up September 10, 1990.

The tunnels lengthened the picking of Tribute by at least 3 weeks, which might have been longer, but due to a hurricane on October 18 the plastic was blown off the hoops and not replaced due to the lateness of the season. The plastic was not damaged.

The tunnel kept the temperature 4–5 degrees celsius warmer than the outdoor temperature. The plants seemed to be able to tolerate a lower temperature due to being drier than with a dew. It was found that the tunnels had to have the sides raised each morning to lower the humidity and closed again at noon so that temperature levels could be raised before sunset.

Production levels were not as high as traditional levels due to increased fruit loss. This was due to higher mildew levels as a result of the high humidity. This can be corrected by daily ventilating the tunnel and the use of a hand sprayer for mildew control.

The fruit, which was pickable, was very good. The fruit was larger than the berries picked before the tunnel was put up.

The demand for the later fruit was equal to the earlier part of the season. The local stores were still requesting the same quantity as was the wholesaler. Local stores were probably buying more than what they would normally order from a wholesaler.

The actual performance of the tunnel is hard to evaluate for this year due to the lateness in setting up the tunnel and the wind problems encountered. A spring and fall evaluation was planned for 1991.

1991 Results – The dayneutral cultivars which were planted in 1990 had considerable winter damage. A decision was made to evaluate the three French tunnels on the early June bearing cultivar Annapolis. The first picking from the first tunnel was June 17, seven days earlier than fruit from the second set of tunnels and field harvest. The price received from the first harvest was $2.00 per quart. Fruit harvest from the second set of tunnels began June 23, the same time as regular field harvest for the early cultivar Annapolis.

The dayneutral cultivars Tribute, Tristar and Fern which were planted May 1991 made excellent growth and produced a massive set of blossoms with good fruit set. Harvest of this fruit began August 19 with a weekly contract to supply one Halifax wholesaler, and two local Truro retail stores. Price received was $12.00 per pint flat. The Halifax wholesaler had to know seven days in advance as to the expected order so as to reduce the amount of imported California fresh berries by a similar amount.

An unusual abundant amount of wasps severely damaged the fresh fruit during harvest in late August and September. The pickers had two problems. They often did not observe the holes the wasps made in the fruit, and they were afraid of the wasps as there were as many as three wasps in one large berry. All the picked fruit had to be repacked and over 50% had to be culled because of fruit damage. The wasp problem reduced the guaranteed supply to the Halifax market by 50%. This created an unhappy situation with the wholesaler as they could not supply their orders to their customers. The wholesaler had to know seven days in advance the volume of strawberries expected. The local Truro market was not able to sell as much fresh strawberries at the higher price, probably due to the recession, and the consumer was more price conscious.

By mid-September a decision was made not to set up the French tunnels because of the wasp problem. The wasp problem could even be greater inside a plastic tunnel than under field conditions.

In order to recover the costs invested in the plastic and hoops, the plastic tunnels will be used in the spring of 1992.

CONCLUSION: The actual performance of the French tunnels has been difficult to evaluate for the years 1990 and 1991 because of weather and wasp problems.

ACKNOWLEDGEMENTS: Appreciation is extended to Canada/Nova Scotia Agri- Food Development Agreement for partial funding and the Technology Introduction and Evaluation Program and to Terry and Dianne Wenham for evaluating the project for the benefit to the strawberry industry.

MALE GYPSY MOTH CAPTURES IN APPLE ORCHARDS

Rick Whitman, Assistant Director – Horticultural Crops

Abstract

The captures of male gypsy moths in Kings County apple orchards have increased over the period of 1987–1991. However, these captures do not necessarily reflect within-orchard populations.

INTRODUCTION: The gypsy moth, *Lymantria dispar*, is a well-known defoliator native to Europe, Asia and northern Africa. An accidental introduction in Massachusetts in 1869 has led to established populations in much of northeastern United States and adjacent parts of Quebec and Ontario. Local populations have been detected at a number of locations in western Nova Scotia since 1981. In Kings County, gypsy moth is known to be established at New Minas, Port Williams and Canning in particular. For the past five growing seasons pheromone traps have been used to monitor adult male gypsy moths in 25 Kings County apple orchards.

MATERIALS AND METHODS: The standard gypsy moth pheromone trap, as used by Forestry Canada and Agriculture Canada, was used to capture male gypsy moths during the period 1987–1991. The trap used in 1991 was the Trece Inc. Pherocon III D trap. A single trap was placed in each of 25 apple orchards in Kings County, each year. The exact locations of the traps were unchanged throughout this period with the exception of two locations where the original blocks were removed and the locations were moved to adjacent blocks on the same two farms. The 25 farms were located in an area bounded roughly by Melanson–Grand Pre–Pereau–Dempsey Corner–Factorydale. Every trap was hung in an apple tree as near to head height as was practical. Traps were placed each year during the period July 20-30 and retreived during the period September 16–24.

RESULTS AND DISCUSSION: The trapping results are reported in the following Table.

Table 1. Gypsy Moth Captures in Kings County Apple Orchards.

Year	Traps Placed	Traps Retrieved	Positive Traps	Total Captures	Average Capture	Range of Captures
1987	25	25	11	17	0.7	0–3
1988	25	25	12	18	0.7	0–3
1989	25	24	17	71	3.0	0–14
1990	25	25	19	85	3.4	0–18
1991	25	24	20	145	6.0	0–23

The trap captures over the five–year period clearly reflect an increasing gypsy moth population in Kings County. However, the extent to which these data relate to gypsy moth populations within apple orchards is much less clear. The male gypsy moth is a strong flier and it is likely that these captures primarily reflect populations in the towns and villages of the county currently. To date the author has observed gypsy moth eggs or larvae only in an unsprayed

orchard in New Minas and a small orchard in Paradise, Annapolis County. If gypsy moth spreads throughout the rural parts of the Annapolis Valley, it will be a significant pest problem primarily in non-bearing and other unsprayed orchards.

ACKNOWLEDGEMENTS: The pheromone traps used were supplied by Agriculture Canada, Food Production and Inspection Branch.

POSTHARVEST EVALUATION OF SCAB-RESISTANT APPLE CULTIVARS TREATED WITH WUXAL SUSPENSION CALCIUM

W. D. Craig, N.S.D.A.&M.
R. K. Prange & J. R. DeEll, Agriculture Canada

Abstract

Two out of nine scab resistant apple cultivars demonstrate calcium related fruit disorders. Foliar application pf Wuxal calcium suspension reduce bitter pit in the cultivar Prima and senescent breakdown in the cultivar Moira.

INTRODUCTION: Observations of fruit harvested from the NSDA&M scab-resistant apple cultivar demonstration indicated that certain cultivars appeared to be prone to bitter pit. Bitter pit is a disorder in which small, brown, somewhat dry, slightly bitter tasting lesions 3-5 mm in cross section develop in the flesh of the apple (1). This disorder can appear in the apple prior to harvest or after the fruit has been placed in storage. Cultivars vary in their susceptibility to this disorder which is related to low levels of calcium in the flesh of apples. Senescent breakdown is a postharvest disorder of apples that can be influenced by levels of calcium in the flesh of apples.

Foliar application of calcium can increase the level of calcium in the flesh of apples thereby reducing or eliminating low calcium related disorders (2). In recent years a number of foliar nutrient sprays containing calcium have been introduced to apple growers. Wuxal suspension is one of the newer foliar nutrient sprays and a field trial was set out in 1990 to evaluate this product.

MATERIALS AND METHODS: Two trees each of 9 apple scab resistant-cultivars were treated with Wuxal suspension 16-0-0-3-24 CaO (w/v) during the 1990 growing season. Wuxal suspension containing 10.72% calcium by weight/volume was applied as a dilute spray at two-week intervals commencing on June 12. A total of 5 applications of Wuxal suspension were applied at a rate of 136.4 mL/18 gal of water (5.5 L/ha). Two trees of each cultivar were not treated with calcium.

Following harvest 1/2 bushel samples of the treated and non-treated apples of all 9 cultivars were placed in two cold storage regimes. The two regimes were ambient air with a temperature of 3°C and controlled atmosphere (2.5% 0_2 and 4.5%$C0_2$) with a temperature of 3°C. Apples were removed from the two storages after 3 and 6 months and evaluated for calcium related disorders.

RESULTS AND DISCUSSION: Two of the 9 cultivars demonstrated a significant response to the foliar application of calcium. Prima was the only cultivar to show a bitter pit problem. The two storage regimes did not have an influence on the incidence of bitter pit in this cultivar. The foliar applications of calcium did reduce the percentage of fruit with bitter pit from 18% to 0.3% (Table 1). The only cultivar to demonstrate a senescent breakdown problem was Moira. The cold storage regime and calcium treatment both influenced the percentage of apples with senescent breakdown. Apples stored in C.A. storage had a lower incidence of senescent breakdown than those in regular cold storage. Controlled atmosphere storage slows the aging process of apples thereby reducing the onset of senescent breakdown. After 6 months storage the Moira apples had broken down to the point where they could not

be evaluated. The foliar application of calcium reduced the percentage with senescent breakdown after 3 months in regular cold storage and after 6 months in C.A. storage (Table 2). As the susceptibility of fruit to this disorder is dependent on calcium content in the fruit, the foliar application did increase the content of flesh calcium to delay the onset of senescent breakdown.

Although Wuxal suspension was not compared with the standard calcium foliar spray of calcium chloride, the trial demonstrates that this material was effective in reducing bitter pit and senescent breakdown on two of the 9 scab-resistant cultivars.

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Table 1: Affect of Wuxal suspension on the incidence of bitter pit.

Cultivar	% of fruit with bitter pit	
	treated	untreated
Britegold	0.09	1.0
Nova Easygro	0.10	1.2
Novamac	1.40	0
Prima	0.30	18.0
Redfree	0.07	0.2
Macfree	0	0.2
Trent	0.90	0.5
Priscilla	0	0
Moira	0	0

Table 2: Affect of C.A. storage and Wuxal suspension on senescent breakdown of the cultivar Moira.

Treatment	% of fruit with senescent breakdown	
	3 months	6 months
Treated		
Air	12.2	*
C.A.	0	44.4
Non-treated		
Air	35.1	*
C.A.	0	77.6

ORCHARD SYSTEMS TRIAL

W. E. Craig, Tree Fruit Specialist, & J. Arnold, Technician
D. Nichols, Apple Producer

Abstract

Four tree training systems, Tatura V Trellis, Vertical Axis, High Density and 155 System are being compared in a commercial three acre planting of Idared and McIntosh apple trees. Trees in the 155 system had the highest per tree yield while the Tatura V Trellis was the most productive system in 1991. After five years of cropping the vertical axis system has the highest accumulated yields.

INTRODUCTION: This producer trial was set out in 1985 to obtain information on the performance of three high density planting systems which would aid the producer and the Nova Scotia Tree Fruit Industry in selecting planting systems for future orchard renewal. Three planting systems, Tatura V Trellis (544 trees/acre), Vertical Axis (580 trees/acre), High Density (415 trees/acre) are being compared to the industry standard, 155 system (155 trees/acre). The establishment of this trial and the first four years of cropping were reported on in the 1990 Plant Industry Research Reports. One of the advantages of high density systems is earlier cropping which is required to offset the higher establishment costs of these systems. Thus, the annual production figures are being published to assist growers with their choice of new high density planting systems.

MATERIALS AND METHODS: General Orchard Maintenance and tree training was carried out by the producer with fungicide and insecticides being applied when required. McIntosh apples were harvested between September 25 and 28 and Idared apples between October 11 and 18. Pickers were instructed only to harvest apples that would meet the fancy grade. Cull apples were dropped on the ground, these included small, poorly colored or insect damaged apples. The weight of fresh picked apples was weighed on a per row basis for each cultivar. Cull apples were picked up on October 23 and were weighed on a per row basis for each cultivar. The number of live bearing trees was recorded on a per cultivar and row basis. The yield on a per acre basis was determined by multiplying the average yield per tree by the tree density for each planting system. The girth of each tree was measured at 50 cm from the soil surface in late November.

RESULTS AND DISCUSSION: The highest per tree yield in 1991 was recorded for those grown in the 155 system (Table 1 & 2). The yield for Idared continued to be greater than McIntosh for trees trained to this sytem. The largest trunk cross sectional areas were recorded for those trees in the 155 system (Table 6) The rootstock utilized in the 155 system is MM 111 a semi-dwarf rootstock which has resulted in the larger trees and higher yields on a per tree basis. Trees in the Tatura V Trellis which had the second highest yield and trunk cross sectional area are also on the rootstock MM 111. The wire trellis training system is being used to control tree size and thus a smaller trunk cross sectional area compared to trees in the 155 system. Trees in the High Density and Vertical Axis System are both on EM26 which explains the lower per tree yields and trunk cross sectional area.

Converting the per tree yield to a per acre basis the highest yield was recorded for the Tatura V Trellis followed by Vertical Axis System (Table 3 & 4). The 155 system which had the highest per tree yield had the lowest and second lowest yields on a per acre basis. Prior to 1991 the Vertical Axis System has been producing the highest yield per acre. The Tatura V

Trellis has been slower in developing a fruit bearing surface than the other two high density systems. The slower tree growth is partly due to the lack of experience in training trees to this system.

In 1991 Idared yields were higher than those from McIntosh which is a reversal of 1990 yields (Table 3 & 4). The lower McIntosh yields in 1991 could be a bi-annual bearing effect in response to higher yields in 1990 or due to spring frost damage. Spring frosts on May 19 and 22 caused extensive fr't damage throughout the Valley. Idared which develops fruit buds earlier than McIntosh appears to be more cold tolerant than McIntosh and yields were not reduced as greatly as other cultivars.

The highest accumulated yields per acre after five years of cropping were recorded for the vertical axis system. McIntosh in this system has been 2.7 times more productive than those in the 155 system, while Idared has been 1.8 times more productive.

Two growth related problems were noted in 1991. Perennial and/or Anthracnose canker infected a number of McIntosh trees in the vertical axis system. This canker either killed portions of the tree or weakened them thus reducing productivity. The other ongoing problem is that non-supported trees on EM26 rootstock in the High Density System continue to lean over particularly where soil depth is shallow. As a result tree vigor is lost and very little vegetative growth is occurring which is reducing productivity. It is also becoming apparent that soil depth varies within the site as tree growth within each system varies. In areas of shallow soil depth due to outcropping of ledge tree growth is much weaker than those trees growing in soil with good depth. The difference in tree growth is presenting some problems for the producer as he has to contend with excessive vigor in portions of the planting and lack of vigor in others.

This trial is providing the producer with good practical experience in managing High Density Systems and selecting a system or systems for future orchard renewal.

Table 1: Average yield per tree for Idared trees grown under four different management systems.

	1987 kg/tree	1988 kg/tree	1989 kg/tree	1990 kg/tree	1991 kg/tree
155	0.40	7.96	9.93	28.57	36.50
High Density	1.79	6.50	7.86	8.77	17.26
Vertical Axis	1.28	6.85	8.18	9.44	15.07
Tatura V	0.09	0.10	5.71	9.81	20.28

Table 2: Average yield per tree for McIntosh trees grown under four different management systems.

	1987 kg/tree	1988 kg/tree	1989 kg/tree	1990 kg/tree	1991 kg/tree
155	0	1.76	6.09	20.68	33.31
High Density	0.06	5.33	5.83	15.78	11.70
Vertical Axis	0.23	7.37	8.64	17.21	11.83
Tatura V	0	0.27	3.19	15.78	13.49

Table 3: Yield per acre for Idared grown under four different management systems.

	1987 bu/ac	1988 bu/ac	1989 bu/ac	1990 bu/ac	1991 bu/ac
155	3.18	65.43	81.49	233.07	297.75
High Density	37.57	141.32	171.24	191.56	377.01
Vertical Axis	38.15	210.94	251.84	288.17	460.03
Tatura V	2.29	71.58	161.48	280.86	580.67

Table 4: Yield per acre for McIntosh grown under four different management systems.

	1987 bu/ac	1988 bu/ac	1989 bu/ac	1990 bu/ac	1991 bu/ac
155	0	27.24	49.19	168.70	271.51
High Density	1.09	137.39	127.99	344.67	255.51
Vertical Axis	7.02	256.12	262.52	525.36	361.41
Tatura V	0	8.59	92.76	451.81	386.32

Table 5: Accumulated yields (1985 — 1991) of Idared and McIntosh grown under four diferent management systems.

	IDARED		McINTOSH	
	kg/tree	bu/ac	kg/tree	bu/ac
155	83.36	680.85	61.84	516.94
High Density	42.18	919.14	38.70	866.98
Vertical Axis	40.82	1,249.23	45.28	1,412.07
Tatura V	35.99	1,097.02	32.73	939.67

Table 6: 1991 average trunk cross sectional area of Idared and McIntosh trees grown under four management systems.

	Idared	McIntosh
155	50.94	55.04
High Density	21.40	28.43
Vertical Axis	20.37	28.73
Tatura V	31.83	38.17

APPLE CULTIVAR EVALUATION

W. E. Craig & John Arnold, N.S.D.A.M.
Dr. C. Deslauriers & C. Embree, Agriculture Canada

RESEARCH NOTE

New cultivars or strains of cultivars are being introduced at an accelerated pace due to the potential for higher grower returns and increasing emphasis on disease resistance. Most of the new selections have been found or developed in areas outside of Nova Scotia and therefore need to be evaluated in order to provide producers with accurate information on the suitability of the selection for Nova Scotia growing conditions. Agriculture Canada doesn't recognize cultivar evaluation as research and therefore there is not a formal apple cultivar evaluation program in Nova Scotia. In order to bridge this gap on cultivar evaluation the Nova Scotia Department of Agriculture and Marketing and Agriculture Canada are in the process of signing a Memorandum of Agreement whereby apple cultivar evaluation will be carried out by the Plant Industry Branch at the Kentville Research Station.

A rapid screening method utilizing M9 rootstock and a trellis system will be used to evaluate apple cultivars and strains as rapidly as possible and to determine their potential for the Nova Scotia Tree Fruit Industry. Trees for the yearly plantings will be propagated in Agriculture Canada's fruit tree nursery with 10 rootstocks budded with each selection. A total of six trees of each selection will be planted and compared to two standards, McIntosh (Blackmac) and Red Delicious (Starking Red). These two standards will be set out with each new planting.

In 1990 M9 EMLA rootstock was purchased and budded with the following selections for planting in the spring of 1992:

Jonagold Strains	McIntosh Strains
- Original	- Marshall
- Nicobel	- Rogers
- Red	- Macspur
- Wilmuta	- Hartenhof
- Hilltop	- Blackmac VI
- Virusfree	- Summerland
	- Summerland - 76 - 2
	- Stirling

Jonamac
Jerseymac

The following selections were budded to M9 EMLA in August 1991 for planting in 1993.

Cox's Orange Pippin	Criterion
Egremont Russet	Elstar
Fiesta	Firm Gold
Gala	Golden Delicious
Golden Nuggett	Golden Delicious — spur type
Golden Russett	Greensleeves
Honeygold	Jupiter
Katja	Mutsu
Kestrel	McIntosh — Blackmac VI
Suntan	Red Delicious — Starking Red
Sinta	Shamrock
Virginia Gold	Korona
Kentville Selections	
S51 – 6 – 136	
S47 – 25 – 52	
S47 – 25 – 70	
S47 – 25 – 102	

It is hoped that 30 or more selections will be set out on an annual basis.

UNHEATED GREENHOUSE PEPPER CULTIVAR TRIAL 1991

Charles Thompson, Vegetable Specialist
Kim Best, Horticultural Technician

Abstract

Six cultivars of sweet peppers were grown in an unheated poly greenhouse to determine yield, quality and adaptability to this production system. The cultivar "Laparie" yielded the best with excellent quality fruit. A commercial standard cultivar "Bell Boy" as well as the cultivars, "Quattro" and "Capri" yielded slightly less than "Bendigo". The cultivar "Golden Boy" had the lowest yield, but could be marketed as a speciality crop for a premium price.

INTRODUCTION: Pepper production in unheated greenhouses has the potential to be used as a follow up crop in greenhouses that normally would set empty from late spring through summer. The use of the greenhouse should extend the season of this crop, allowing earlier transplanting for early harvest and frost protection for later harvest. The purpose of this trial is to identify cultivars that are suitable for this production system.

MATERIALS AND METHODS: One half of the floor area of a 4 x 28 meter unheated, poly tunnel greenhouse was utilized for this trial. A fertilizer application of 17-17-17 at 560 kg/ha and 0-0-60 at 112 kg/ha was applied prior to the installation of a trickle irrigation system covered with black plastic mulch. Eight week old transplants were set in 1.8 m rows running one half the width of the greenhouse. Plants were spaced 62 cm between plants and 90 cm between rows. The cultivars used were "Laparie", "Bendigo", "Capri", "Quattro", "Golden Boy" and "Bell Boy". Harvest began July 30 and continued until September 30, 1991 with a total of four harvest dates. Yield and quality data was collected.

RESULTS AND DISCUSSION: The cultivar "Bell Boy" was used as a standard. However, the cultivars "Laparie" and "Bendigo" produced better overall than "Bell Boy". "Bell Boy", "Quattro" and "Capri" all produced similar yields and quality fruit. "Golden Boy" is an exceptional golden or yellow sweet pepper. The yield was lower than the other cultivars but it is proposed that marketing this pepper as a specialty crop could potentially obtain premium prices.

In terms of appearance, which subsequently affects consumer acceptability, "Bell Boy" was the only cultivar that produced a typical green, blocky pepper. The cultivar "Laparie" produced an elongated, extremely tapered, large fruit with seeds only immediately adjacent to the stem end. This makes it very easy to prepare for eating. However, initial consumer acceptance was poor due mainly to lack of familiarity. This shape as well tends to lead the consumer to be suspicious that it is a "hot" pepper. Convincing the consumer to try it once usually was sufficient as they would then return for that particular cultivar. The cultivars "Capri", "Quattro" and "Bendigo" had somewhat of an elongated shape, "Capri" and "Quattro" having a slightly tapered blossom end. None of these were tapered to the extent that Laparie was.

All the peppers except "Golden Boy" were of good quality picked green, as well as when picked red. Laparie was exceptional as a red fruit. Refer to table for quality rating. On a visual scale of 1 through 5 the rating of 5 generally denotes the most desirable characteristics.

Table 1: UNHEATED GREENHOUSE PEPPER PRODUCTION

Cultivar Name	Yield kg/m^2	Shape 5 = very tapered	Firmness 5=very firm	Appearance 5=very good	Smoothness 5=very smooth	Uniformity 5=very uniform	Scarring 5=none	Ext. Color 5=dark green	Reddening 5 =none	Overall 5=very good
Laparie	4.7	5	2.8	5	4.4	4.4	4.6	2.9	4.3	4.9
Capri	3.0	2.5	3.4	3.8	4.8	4.3	4.6	4.0	4.8	4.0
Quattro	3.1	2.5	3.4	4.0	4.6	3.3	4.4.	4.0	5.0	3.8
Bendigo	3.4	2.9	4.0	3.9	4.8	3.3	4.4	3.5	4.3	4.0
Bell Boy	3.0	1	4.3	4.3	4.5	3.8	4.0	3.8	4.0	4.3
Golden Boy	1.6	1	4.5	5	4	4.5	3	gold.	5.0	4.5

As a comparison, the same cultivars were grown in a small observational plot in the field without the use of plastics. Yield and quality was much lower. This may be attributed to drought stress and wind damage. The performance of each cultivar in relation to one another was similar in the field and the greenhouse.

CONCLUSION: An unheated poly tunnel greenhouse is an effective system to extend the season of crops, as well as enhance the performance of more tender, heat loving crops. As well, an environment that is more favorable for crops is also more favorable for pests, thus preventative and corrective measures must be strictly applied. The cultivar "Laparie" performed the best in this trial as compared to the other cultivars grown. It was, however, a different "type" of sweet green (or red) pepper as it was elongated and tapered in shape as opposed to the more familar short, blocky shape. This could be overcome using effective marketing practices, that educate the consumer. The cultivar "Golden Boy" showed great potential as a sweet yellow (or golden) pepper. Quality was supreme. Overall, the production of summer crops in an unheated greenhouse during periods when this facility would otherwise be empty, is a more efficient method of utilizing existing facilities, providing a market has been found to accept the crop. This project did not, however, investigate the economics of building a greenhouse solely for this production system.

LETTUCE TRIAL 1991

Charles Thompson, Vegetable Specialist
Kim Best, Agricultural Technician

Abstract

Four types of lettuce, with a total of twenty-four cultivars, were evaluated for their performance in Nova Scotia conditions. Many of these cultivars performed well. Partially as a result of this trial the cultivar "Salinas" was recommended for production in Nova Scotia and "Talisman" was labelled as a promising cultivar. "LM 9961" showed great promise and will be retested.

INTRODUCTION: A lettuce cultivar trial was conducted to determine the potential of new or untried cultivars for N.S. commercial lettuce production.

MATERIAL AND METHODS: Twenty-four cultivars of a variety of lettuce types were tested in this trial, including head, romaine, butterhead and leaf lettuce. Six week old transplants were planted in the field May 30, 1991. Harvesting began July 2, 1991. Most all cultivars matured uniformly and required only one harvest. The latest maturing cultivars were harvested July 19, 1991. Yield and quality data was collected immediately after harvest. The leaf and butterhead lettuce was stored at 2°C for one week after harvest to determine keeping quality.

HEAD LETTUCE

CULTIVAR	WT/HEAD (g)	MEASUREMENTS Polar (cm)	Equator (cm)	*RIB SIZE	*UNIFORM	*OVERALL
Salad Crisp	431	12.4	11.7	5	3	4
Frosty	826	15.5	15.0	2	3	1
LM 9304	690	15.2	13.7	3	4	4
Talisman	595	15.5	13.1	2	4	3
TS 2059	503	13.5	12.6	2	4	4
Salinas	511	15.4	13.1	2	3.5	4
LM 3297	407	13.5	11.7	4	1	2
TS 907	442	12.1	12.5	4	5	5

BUTTERHEAD LETTUCE

CULTIVAR	WT/HEAD (g)	MEASUREMENTS Polar	Equator	*RIB SIZE	*UNIFORM	*OVERALL
Pontiac	225	10.7	10.5	5	3	3
Floret	236	11.5	10.6	4	5	5
Ostinata	201	9.5	9.5	4	4	4
Titania	244	10.0	10.0	4	4	4
Sitonia	261	9.9	9.8	3	5	5

ROMAINE

CULTIVAR	WT/HEAD (g)	MEASUREMENTS Polar	Equator	*RIBSIZE	*UNIFORM	*OVERALL
Romulus	638	23.7	12.6	3	5	4
Paris Island	592	23.1	12.6	1	4	5

LEAF LETTUCE

CULTIVAR	WT/HEAD (g)	MEASUREMENTS Polar	Equator	*RIBSIZE	UNIFORM	OVERALL
Valeria	92	10.7	9.8	3	4	4
Red Fire	186	16.5	11.5	3	4	5
LM 277	174	17.8	9.8	1	2	2
Red Sails	186	14.5	9.9	1	3	3
Ruby	141	16.3	9.5	2	4	5
LM 9961	265	12.7	15.6	2	4	5
Super Prize	278	16.0	13.8	3	4	5
Fanfare	308	18.2	12.9	3	4	4
Royal Green	344	18.1	11.7	2	4	3

*Ribsize	1 = large 5 = small
Uniformity	1 = poor 5 = excellent
Overall	1 = poor 5 = excellent

RESULTS AND DISCUSSION: Overall the cultivars in this trial performed well despite the hot dry weather. Some stress related problems were detected in the head lettuce. This included slime and a bit of head twisting at the later harvests. Tipburn was detected on the leaf lettuce. This was attributed to stress as well. Refer to Tables for results.

CONCLUSION: Several cultivars in this trial proved to be superior to others. In the head lettuce trial "Salad Crisp", "Talisman" and "Salinas" performed quite well. "Salad Crisp" was formerly recommended for cultivation in Nova Scotia. "Salinas" was added to the recommended list of vegetable cultivars, **Vegetable Newsletter, December 5, 1991.** "Talisman" was also added as a promising cultivar. Several of the numbered cultivars in this trial warrant re-testing in future trials. The five cultivars of butterhead lettuce all performed well. "Floret" seemed to show the most potential. "Paris Island" and "Romulus" are both excellent romaine lettuce cultivars and performed well in the trial. In the leaf lettuce trial several cultivars proved well suited to Nova Scotia production. The highest rated include "Ruby", "Red Fire" and "Super Prize". "LM 9961" was an "oak leaf" type which performed well and was extremely attractive. A more detailed description of all cultivars is included in the "On-Farm Vegetable Cultivar Project Report 1992" by Kim Best and Charles Thompson.

RED CABBAGE CULTIVAR TRIAL 1991

Charles Thompson, Vegetable Specialist
Kim Best, Agricultural Technician

Abstract

Nine cultivars of red cabbage were grown in a field trial in 1991. Although the season was extremely dry, yield and quality were good. Cultivars most suited to Nova Scotia markets were determined to be those that are firm, uniform with a round head of 1 — 1 1/2 kg and high marketable yield. "Ruby Perfection", "Rio Grande Red" and "Red Rookie" were found to meet these criteria and performed the best in this test.

INTRODUCTION: The purpose of this trial was to identify red cabbage cultivars suitable for production in Nova Scotia.

MATERIALS AND METHODS: Six week old transplants of nine cultivars of red cabbage were transplanted in the field, May 31, 1991. Data was collected at harvest. This included: head weight, uniformity of heads and head diameters, both polar and equator, which indicate head shape.

RESULTS AND DISCUSSION: "Red Rookie", "Rio Grande Red" and "Ruby Perfection" performed the best of all cultivars. These cultivars had good shape, size and quality characteristics suited to the Nova Scotia market. The six remaining cultivars were attractive as well but uniformity and head shape were undesirable. Refer to Table.

CONCLUSION: New cultivars and untried cultivars of red cabbage have become available. "Ruby Perfection" was on the 1990 most promising list of cultivars and "Rio Grande Red" has been added for 1991. "Red Rookie", as well as others, will be tried again in the future.

Table 1: RED CABBAGE CULTIVARS 1991

Cultivar	Wt./Head grams	Measurements (cm) Polar	Equator	Uniformity
Red Rookie	944	13	13	4
Rio Grande Red	1396	14.6	14.6	4
Meteor	1023	15.2	11.5	4
Red Danish	1479	17.6	14.7	3
Pierrette	951	12.7	13.1	3
Red Debut	1008	13.7	12.8	3
Rona Red	1308	14.5	14.4	2
Expo	1219	15.6	13.6	3
Ruby Perfection	1399	15.1	14.0	4

* Uniformity Rating 1 – 5

1 = poor
5 = excellent

VEGETABLE CULTIVAR PROJECT 1991

Charles Thompson, Vegetable Specialist
Kim Best, Agricultural Technician

Abstract

The Horticultural Crops Section of the Plant Industry Branch together with the Vegetable and Potato Producers Association of Nova Scotia carried out an on-farm Vegetable Cultivar Project in 1991. This was completed in similar format to previous years trials that were partly AFDA funded. Thirty growers participated, growing cultivars that have shown potential in trials. These cultivars were established on a small commercial basis in fields adjacent to standard commercial cultivars. Over 130 vegetable cultivars of 20 vegetables were tried on-farm as well as in NSDAM demonstration trials at the Kentville Agricultural Centre and the farm of Charles O. Keddy, Lakeville. A copy of the complete project report will be provided on request.

EGGPLANT YIELD TRIAL 1991

Charles Thompson, Vegetable Specialist
Kim Best, Agricultural Technician

Abstract

A trial to determine yield potential of the eggplant cultivar "Dusky" was carried out in one half of the area of a 4 x 28 meter unheated poly tunnel greenhouse. Quality and production of the fruit was good despite excess heat and insect problems.

INTRODUCTION: The purpose of this trial was to determine the yield potential of the eggplant cultivar "Dusky", in an unheated tunnel greenhouse production system. This is the only eggplant cultivar recommended for production in Nova Scotia.

MATERIALS AND METHODS: Eight week old transplants of the eggplant cultivar "Dusky", were planted in an unheated tunnel greenhouse June 4, 1991. A fertilizer application of 560 kg/ha of 17-17-17 and 112 kg/ha of 0-0-60 was applied to the sandy soil previous to laying trickle irrigation lines and black plastic mulch. Plots were set out in 1.8 meter rows running the width of half of the greenhouse. Plants were spaced 62 cm apart with the rows 90 cm apart. Total plant number was 72. Some pest control practices were necessary to combat earwigs, tarnished plant bugs and spider mites. Fruit was harvested at approximately 275 – 300 grams in size. Yield data was collected as well as visual comments regarding quality and consumer acceptance.

RESULTS AND DISCUSSION: Harvesting began July 30, 1991 and continued until September 30, 1991. Quality throughout the entire cropping season was excellent. Fruit was almost completely blemish free. Color was very dark purple with the fruit having a waxy cuticle and thus a very clean, shiny appearance. Total yield was determined to be 98 kg for the 72 plants. This calculates out as 6.2 fruit per plant or 2.5 kg/m2. Consumer acceptance was excellent.

CONCLUSION: The eggplant cultivar "Dusky", performed well in terms of yield and quality in this unheated greenhouse production system.

VPPA VEGETABLE CULTIVAR TRIALS AND CROPS PROFILES 1991 – 1994

Charles Thompson, Vegetable Specialist
Kim Best, Agricultural Technician

Abstract

The Vegetable and Potato Producers Association of Nova Scotia has conducted cultivar trials and compiled "Crop Profile" booklets in 1991 – 92 and will continue to do so under a three year program funded by the Nova Scotia Crop Development Institute and the Canada – Nova Scotia Agri-food Development Agreement. Cooperators also include Agriculture Canada and Charles Thompson and Kim Best from the Plant Industry Branch of the Nova Scotia Department of Agriculture and Marketing. One full time technician, Mary Jansen, was hired through this project for the three year term. The cultivar trials for 1991 consisted of three on-farm trials in three separate locations. A spinach cultivar trial was conducted on the farm of Greg Coldwell in Port Williams, Kings County to identify cultivars suitable for mechanical harvesting. A sweet corn trial was conducted on the farm of Glen Ells, Sheffield Mills, Kings County, to identify cultivars of sweet corn suitable for mechanical harvesting. The third cultivar trial consisted of fifty-five cultivars or strains of dried beans. This was located on the farm of Charles Keddy, Lakeville, Kings County. Reports on the results of these trials are available on request.

The purpose of the "Crop Profiles", is to bring together information on vegetable crop production available worldwide, perhaps not accessible to growers and compile it into one booklet per crop. The crops to cover in 1991 – 92 include Cole Crops and Carrots and will be made available to all growers. These will be printed by March 31, 1992.

FUNGUS GNAT *Bradysia* spp. CONTROL USING *Bacillus thuringiensis* Serotype H-14

Bev MacPhail, P.Ag., Greenhouse Specialist; Kim Best, Technician

RESEARCH NOTE

Fungus gnat adults are small, dark-bodied flies less than 3–4 mm long and the larvae have a long white legless body with a shiny black head capsule. They are often referred to as peat flies with the adults resting on the surface of soilless mixes. The larvae feed on many kinds of fungi, bacteria and decaying plant material. They are often considered just a nuisance but with a high population of larvae they can feed on plant roots and cause root damage on seedling and rooted cuttings. In addition to root injury, fungus gnats can spread soil pathogens.

The bacteria *Bacillus thuringiensis* (B.t.) Serotype H-14 is registered in the United States for control of fungus gnat on greenhouse plants.

Two trials were done in 1991 on the efficacy of B.t. Serotype H-14 as a control for fungus gnats at Cornwallis Nursery, a rhododendron propagator and grower in Sheffield Mills and at the Kentville Agricultural Centre on a selection of bedding plants. These trials were in cooperation with Abbott Laboratories which is pursuing full registration of B.t. Serotype H-14 for fungus gnat control on greenhouse crops. Agriculture Canada granted permission for the trial under the research permit number 49-RP-91. Agriculture Canada and Abbott Laboratories determined the experimental design and procedures for the efficacy trial.

The results of the two trials were sent to Abbott Laboratories for analysis to support their effort in registering B.t. Serotype H-14 fungus gnat control.

GARDEN MUMS FOR MOTHER'S DAY 1991

Bev MacPhail, P.Ag., Greenhouse Specialist
Kim Best, Technician

Abstract

Ten garden mum varieties, Bravo, Nicole, Dark Triumph, Yellow Triumph, Ballerina, Ginger, Emily, Red Remarkable, Holly and Tolima, were grown under two treatments: 1) natural day length and 2) light and shade program in 100 mm pots for Mother's Day sales. The flower dates were recorded. The ten garden mum varieties grown are suitable for 100 mm pot production for Mother's Day.

INTRODUCTION: Garden chrysanthemums can be grown as an attractive 100 mm flowering potted plant for Mother's Day and later can be planted outdoors for reflowering in the fall. The 1991 garden mums for Mother's Day trial re-examined four varieties from the 1990 trial — Bravo, Nicole, Ginger and Tolima with the addition of some new varieties to grow for 1991.

MATERIALS AND METHODS: Ten rooted cuttings of the ten garden mums listed in Table 1 were planted in 100 mm pots March 6th, 1991. Five pots were grown under natural day length and five were lighted between 22:00 PM – 2:00 AM with artificial light. On March 20th all the plants were given a hard pinch and the lighting was stopped on the light/shade treatment plants with shading started with black plastic from 16:30 PM to 8:00 AM daily until April 29th. The plants were grown in a soilless growing media with regular feedings with a water soluble fertilizer.

RESULTS AND DISCUSSION: The recorded flower dates for the ten garden mum varieties in the two treatments (1) light/shade and (2) natural day length are found in Table 2. The flower dates were similar for the varieties Bravo, Nicole, Dark Triumph, Yellow Triumph, Ballerina, Ginger, Red Remarkable and Tolima under both treatments. Emily and Holly flowered three to four weeks earlier with natural day length than light/shade. Under the light/shade program, Emily, Red Remarkable, Holly and Tolima were saleable for Mother's Day while Bravo, Nicole, Dark Triumph, Yellow Triumph, Ballerina and Ginger were flowering three weeks before Mother's Day. Under natural day length Bravo, Yellow Triumph, Ballerina and Red Remarkable were saleable for Mother's Day while Nicole, Dark Triumph, Ginger, Emily, Holly and Tolima started flowering before May 1. The varieties that flowered before May 1 in both treatments were still in flower for Mother's Day but were not in peak condition.

CONCLUSION: Garden mums grown from cuttings are an attractive 100 mm flowering pot plant for Mother's Day. Emily and Holly should be grown under a light/shade treatment to time the flowering for Mother's Day. The other eight varieties could be grown under a light/shade or natural day length program for Mother's Day sales.

Table 1: Garden Mums

Variety	Color/Type	Week Response*
Bravo	red decorative	7 week
Nicole	white ivory decorative	7 week
Dark Triumph	bronze decorative	6 week
Yellow Triumph	golden-yellow decorative	6 week
Ballerina	white spider	7 week
Ginger	two-tone bronze decorative	7 week
Emily	lavender decorative	6 week
Red Remarkable	red decorative	7 week
Holly	golden-yellow pompom	6 week
Tolima	white decorative	7 week

* week response - time to flower from shade date

Table 2: Flower Dates for Mother's Day Garden Mums

Variety	Light/Shade	Natural Day
Bravo	April 24	May 8
Nicole	April 24	April 24
Dark Triumph	April 24	April 24
Yellow Triumph	April 24	May 1
Ballerina	April 24	May 1
Ginger	April 24	April 24
Emily	May 1	April 7
Red Remarkable	May 8	May 8
Holly	May 8	April 17
Tolima	May 8	April 24

Note: Mother's Day — May 12, 1991

GARDEN MUM VARIETY EVALUATION

Bev MacPhail, P.Ag., Greenhouse Specialist
Kim Best, Technician

Abstract

Fourteen varieties of garden mums were planted as rooted cuttings May 30th into 606 pacs, five litre pots and 22.4 cm hanging baskets. Two hanging baskets and two five liter pots were grown under natural daylength in the greenhouse. When the plants were established in the 606 pacs they were planted outdoors. The 14 varieties were evaluated in the five litre pots, hanging baskets and outdoor beds. The promotion of garden mum use in Nova Scotia increased in 1991 with display beds at City of Halifax, Nova Scotia Agricultural College, Annapolis Royal Historic Gardens and Kentville Agricultural Centre.

INTRODUCTION: Garden chrysanthemums provide beautiful fall color in the garden and could provide new sales opportunities for greenhouses and garden centres during the early fall. This is the third year garden mums have been grown at the Kentville Agricultural Centre. Over this period, several trials have been conducted including use of a variety of containers, shaded crops versus natural daylength crops and greenhouse production versus field production.

In 1991 the emphasis was on variety evaluation in five litre pots and baskets and promotion of garden mum use. Display beds were established at City of Halifax, Annapolis Royal Historic Gardens, Nova Scotia Agricultural College and Kentville Agricultural Centre.

MATERIALS AND METHODS: On May 30 rooted cuttings were planted in 606 pacs, 5 litre pots and 22.4 cm hanging baskets. The cuttings were hard pinched June 13th. A soilless compost was used with regular feeding with a water soluble fertilizer 15-15-18. After pinching the plants in 606 pacs, they were delivered to NSAC, City of Halifax and Annapolis Royal Historic Gardens for direct plantings in outdoor beds. They were instructed to pinch the plants again before mid-July. The City of Halifax also received two hanging baskets of each of the 14 varieties to use for display at city buildings in the fall. At the Kentville Agricultural Centre two five litre pots and two 22.4 cm hanging baskets were grown under natural daylength in the greenhouse. The plants in the 606 pacs were planted June 19th in the outdoor beds and pinched July 19th.

RESULTS AND DISCUSSION: Comments on the 14 varieties are found in Table 1. The colors of most of the flower varieties in outdoor plots tend to be darker and more intense than the colors of those grown in the greenhouse. Sundoro is excellent outdoors but does not perform well in either a five litre container or a basket. The flower dates recorded at the Kentville Agricultural Centre are compared with the estimated flower dates from the supplier, Yoder Canada Inc. in Table 2.

CONCLUSION: Garden mums grown from rooted cuttings have been evaluated in outdoor beds and for greenhouse production in five litre pots and hanging baskets. The garden mums grown provided beautiful color during the fall. Five display beds of garden mums were established in 1991 to promote their use with the public.

Table 1: Garden Mum Varieties and Description

1.	Illusion:	White quilled daisy 5 L: moderate size; very good; basket: compact and full, excellent
2.	Cream Frolic:	two-tone ivory pompom 5 L: small, full, compact; excellent; basket: compact; very full; very good
3.	Holly:	yellow pompom 5 L: tall but full; very good basket: tall though full; very good
4.	Yellow Triumph:	golden yellow decorative 5 L: compact; very good basket: compact; full; very attractive
5.	Legend:	dark yellow pompom 5 L: moderate size and full; quite good basket: compact and full; attractive
6.	Sarah:	golden bronze quilled decorative 5 L: compact and full; good color and shape; excellent basket: thrip damage in 1991 spoiled the appearance; however the 1990 trial proved a magnificant basket mum; shape, size and flowers were still attractive in 1991
7.	Tanaga:	bronze quilled daisy 5 L: excellent; moderate size; pollen shedding basket: very nice; full; moderate size
8.	Sandy:	bronze daisy 5 L: large; excellent basket: compact and full; attractive
9.	Triumph:	two-tone bronze decorative 5 L: excellent basket: good; moderate size;
10.	Viking:	orange-bronze decorative basket: open, sprawling and tall; not recommended for basket
11.	Shelley:	golden bronze pompom 5 L: excellent; similar to Legend but shorter basket: very compact; full; very good performance
12.	Dark Triumph:	two-tone bronze decorative 5 L: small, full, compact; excellent basket: compact; very full; very good
13.	Emily:	lavender decorative 5 L: tall but full and attractive basket: moderate size; full; quite good
14.	Sunduro:	rose wine decorative 5 L: nice color; tall and sprawling pot basket: very compact; full; very good performance

Table 2: Garden Mums Natural Day Length Program

Variety	Natural Flower Date per Supplier	Recorded Flower Date at Kentville
Illusion	Sept 23	Sept 19
Cream Frolic	Sept 24	Sept 3
Holly	Sept 22	Sept 26
Yellow Triumph	Sept 20	Sept 10
Legend	Sept 18	Sept 26
Sarah	Oct 4	Sept 17
Tanaga	Sept 29	Sept 10
Sandy	Sept 24	Sept 3
Triumph	Sept 20	Sept 10
Viking	Sept 25	Sept 3
Shelley	Sept 23	Sept 26
Dark Triumph	Sept 20	Sept 3
Emily	Sept 26	Sept 19
Sunduro	Sept 28	Sept 10

REGIONAL BEDDING PLANT TRIAL

Bev MacPhail, P.Ag., Greenhouse Specialist
Kim Best, Technician

Abstract

The Kentville Agricultural Centre serves as one of the six locations of the Regional Bedding Plant Trial coordinated by the Atlantic Advisory Committee on Greenhouse and Ornamentals. Cultivars of seed geraniums, multiflora petunias, marigolds, dianthus and snapdragons were evaluated in Kentville in 1991.

INTRODUCTION: The Regional Bedding Plant Trial evaluates bedding plants at six locations — Truro, Kentville, Point Edward, Charlottetown, Hoyt and St. John's. The Atlantic Advisory Committee on Greenhouse and Ornamentals coordinates the trial to identify the most suitable bedding plant cultivars for growers and gardeners in Atlantic Canada.

MATERIALS AND METHODS: The bedding plant evaluation for 1991 included 35 cultivars of snapdragons, 26 cultivars of dianthus, 40 cultivars of petunias, 27 cultivars of geraniums and 16 cultivars of marigolds.

Seeds were sown in a flat on the following dates: geraniums, February 28; multibloom geraniums, March 15; petunias, March 15; marigolds, March 15; snapdragons, March 18; and dianthus, March 18. The geraniums were transplanted March 11–12, except for the multibloom geraniums which were transplanted March 25–26 into 6.5 cm fibre pots. The rest of the bedding plants were transplanted into 5.5 cm fibre pots on the following dates: dianthus, March 27–April 2; snapdragons, April 2–4; marigolds, March 20–25; and petunias, April 4–8. A 1 part soil, 2 parts peat and 1 part sand compost with slow release fertilizer was the growing media. The plants were started at the Kentville Agricultural Centre greenhouses.

June 5 and 6 the bedding plants were transplanted into the outdoor trial beds. Overhead irrigation was used after transplanting and several times during the summer. The bedding plants were rated on garden performance on July 5, July 15, August 2, August 19, August 30 and September 13.

RESULTS AND DISCUSSION: The bedding plants produced a mass of color during July. The drought during August stressed the plants later in the season.

The snapdragons flowered well during July but were poor the rest of the summer. The petunias were exceptional during July but suffered water damage to the blooms with the heavy rains later in the summer. The overall performance on the dianthus was good but the ratings indicate some varieties were much better than others. The marigolds were very good throughout the season and did not suffer the water and heat stress that marigolds did during the trials in 1990. Geraniums are a dependable garden flower in Atlantic Canada and provided a good show of color throughout the 1991 season.

CONCLUSIONS: Cultivars of geraniums, petunias, dianthus, snapdragons, and marigolds were evaluated at the Kentville Agricultural Centre for garden performance during the summer.

Table 1: Dianthus Cultivar Trial - Kentville Field Evaluation

	Garden Performance		
Dianthus Cultivars	July	August	Overall Performance July – Sept
Princess	E	E	E
Princess Scarlet	G	G	G
Princess Crimson	G	G	G
White Charm	G	F	F
Princess Salmon	E	E	E
Rosemarie Salmon	F	P	P
Rosemarie Velvet	G	F	F
Snowfire	G	F	F
Pink Flash	G	G	G
Strawberry Parfait	G	P	F
Raspberry Parfait	G	P	F
Crimson Carpet	G	F	F
Oriental Carpet	F	F	F
Snow Carpet	G	G	G
Fire Carpet	F	G	G
Rose Carpet	G	F	F
Ideal Carmine	E	E	E
Ideal Rose	E	E	E
Ideal Crimson	E	E	G
Ideal Deep Violet	E	E	E
Telstar Picotee	E	E	G
Telstar Purple Picotee	E	E	E
Telstar Crimson	E	E	G
Telstar Scarlet	G	G	G
Telstar White	G	E	G
Festival Picotee	E	E	E

E (Excellent) G (Good) F (Fair) P (Poor)

Table 2: Geranium Cultivar Trial - Kentville Field Evaluation

Geranium Cultivars	Garden Performance July	August	Overall Performance July - September
Multibloom Lavender	G	F	G
Multibloom Red	E	G	G
Multibloom White	G	G	G
Multibloom Salmon	G	G	G
Multibloom Scarlet	E	G	G
Multibloom Pink	E	G	G
Multibloom Scarlet/Eye	E	G	G
Multibloom Bright Rose	G	G	G
Elite Cherry	E	G	G
Elite White	G	G	G
Elite Scarlet	E	E	G
Tiffany	G	G	G
Geronimo	G	G	G
Pinto Red	E	G	G
Pinto White	G	G	G
Orange Appeal	G	G	F
Orbit Cardinal	G	G	G
Elite Salmon	G	G	G
Bandit Red	E	G	G
Elite Pink	G	G	G
Bandit Coral	G	G	G
Orbit Deep Salmon	G	G	G
Orbit Hot Pink	G	G	G
Orbit Light Salmon	G	G	G
Orbit Rose	G	G	G
Cabaret Red	F	G	F
Cabaret Pink	G	G	G

E (Excellent) G (Good) F (Fair) P (Poor)

Table 3: Marigold Cultivar Trial - Kentville Field Evaluation

Marigold Cultivars	Garden Performance July	Garden Performance August	Overall Performance July - September
Voyager Yellow	E	F	G
Voyager Orange	E	F	G
Voyager Golden Yellow	E	F	G
Discovery Yellow	E	F	G
Discovery Orange	G	F	G
Pumpkin Crush	G	F	F
Pineapple Crush	G	F	F
Perfection Gold	E	F	G
Perfection Yellow	E	G	G
Perfection Orange	E	G	G
Inca Yellow	G	G	G
Inca Gold	E	F	F
Inca Orange	G	F	F
First Lady	G	F	G
Orange Lady	G	G	G
Gold Lady	E	G	G

E (Excellent) G (Good) F (Fair) P (Poor)

Table 4: Petunia Cultivar Trial - Kentville Field Evaluation

Petunia Cultivars	Garden Performance July	August	Overall Performance July - September
Celebrity Burgundy Ice	G	G	G
Celebrity Burgundy	E	G	G
Celebrity Raspberry Ice	E	G	G
Celebrity Hot Pink	E	G	G
Celebrity Blue Ice	G	G	G
Celebrity Strawberry Ice	E	G	G
Celebrity Summer Ice	E	G	G
Celebrity White	E	G	G
Celebrity Salmon	E	G	G
Celebrity Red	G	G	G
Primetime Blue Star	G	G	G
Primetime Burgundy Star	E	G	G
Primetime Light Blue	E	G	G
Primetime Red Star	G	G	G
Primetime Rose Star	E	G	G
Primetime Blue	E	G	G
Primetime Burgundy	E	F	G
Primetime Pink	E	G	G
Primetime Light Pink Veined	G	F	F
Primetime Plum	E	F	F
Primetime Red	G	F	F
Primetime Rose	E	F	F
Primetime Salmon	G	F	G
Primetime White	E	G	G
Spring Madness	G	F	F
Midnight Madness	E	F	G
Orchid Madness	E	G	G
Silver Madness	G	F	F
Simply Madness	E	G	G
White Madness	G	F	F
Rose Madness	E	G	G
Sheer Madness	G	F	F
Summer Madness	E	F	G
Burgundy Madness	E	F	G
Plum Madness	E	F	G
Sugar Madness	E	F	G
Coral Madness	G	F	G
Pink Madness	G	G	G
Red Madness	E	F	G

E (Excellent) G (Good) F (Fair) P (Poor)

Table 5: Snapdragon Cultivar Trial - Kentville Field Evaluation

	Garden Performance		
Snapdragon Cultivars	July	August	Overall Performance July - September
Floral Showers Bronze	P	F	F
Floral Showers Deep Rose	P	F	F
Floral Showers Scarlet	P	F	F
Floral Showers Lilac	F	F	F
Floral Showers Purple	P	F	F
Floral Showers Crimson	F	F	F
Floral Showers Rose Pink	F	F	F
Tahiti White	F	F	F
Tahiti Yellow	F	F	F
Princess White with Purple Eye	F	F	F
Sonnet White	G	F	F
Sonnet Yellow	G	F	F
Sonnet Pink	G	F	F
Sonnet Rose	G	F	F
Sonnet Bronze	G	F	F
Sonnet Orange Scarlet	F	F	F
Sonnet Crimson	E	F	G
Sonnet Burgundy	E	F	G
Sonnet Carmine	G	F	F
Liberty Bronze	F	F	F
Liberty Crimson	E	F	G
Liberty Light Pink	G	F	F
Liberty Scarlet	G	F	F
Liberty Yellow	F	F	F
Liberty Cherry	F	F	F
Liberty Lavender	G	F	F
Liberty Rose Pink	G	F	F
Liberty White	F	F	F
Sprite Orange	G	F	F
Sprite White	G	F	F
Sprite Cherry	F	F	F
Sprite Pink	F	F	F
Sprite Yellow	G	G	G
Sprite Crimson	G	F	F
Sprite Scarlet	G	F	F

E (Excellent) G (Good) F (Fair) P (Poor)

DRIED FLOWER OBSERVATIONAL TRIAL 1991

Bev MacPhail, P.Ag., Greenhouse Specialist
Kim Best, Technician

Abstract

A variety of plant material was grown in an observational trial for the purpose of drying or preserving for later use. Many plants responded very well in one of a number of preservation techniques. The production of dried flowers is labor intensive. The use of a bed planting system and the use of mulches were tried and proved to aid in reducing labor.

INTRODUCTION: The purpose of this trial was to become familiar with standard, as well as unknown species, of dried flowers suitable for drying in order to respond to the increasing number of inquiries on this crop. A variety of methods of plant production and preservation were investigated.

MATERIALS AND METHODS: Approximately 30 cultivars of 16 plant species were observed to determine productivity in an outdoor field production system. Plants were harvested at recommended growth stages if these were available. Literature research was carried out to determine appropriate methods of drying according to plant type. This information was often difficult to obtain on less popular or "new" dried flowers.

Direct seeding and transplanting were used, depending on the plant. Single rows, as well as beds were tried. Applying mulch for weed control was tried in comparison to open, hand cultivated rows.

After harvest, plants were dried. Methods of drying included:

1. airdrying
   - (a) in a dry, dark room
     - i. hung upside down in bunches by the stems
     - ii. hung through a wire mesh rack supporting the flower head only
   - (b) in a greenhouse to allow color to bleach out
   - (c) removing stems and replacing it with a 21 gauge wire stem
2. glycerine preservation

RESULTS AND DISCUSSION: Many plants commonly grown are suitable for dried flower production. However, some species lend themselves particularly well to this. These include many popular dried flower species such as: statice, gypsophila, helichrysum, acrolinium, Bells of Ireland and gomphrena. All of the plants dried reasonably well hung upside down in a dark, dry room. Helichrysum and gomphrena were dried by removing the stem, inserting a 21 gauge wire stem and drying upright in a container. Bells of Ireland were hung upside down in the greenhouse to allow the green color to bleach to a subtle golden. Eucalyptus was dried both by hanging and by glycerine preservation. The glycerine treatment results in a much more flexible finished product than the air dried. All the statice types dried beautifully hung upside down in the dark. Achilla and Queen Anne's Lace were air dried with the flowers resting on a wire rack.

The production system of planting in a bed proved some advantages over the single row planting. As the plants grew and filled in, the weeds were kept down through competition. As this trial was observational, no actual counts or measurements were done to determine yield. However, the bed system seemed to produce a better quality and quantity of stems per plant. This may be attributed to competition and reduced moisture loss from the soil as the plant leaves provided good cover.

Two methods of mulching were tried. Both used grass clippings. One method used grass only and the other consisted of newspaper covered with grass clippings. The soil was moist when these mulches were applied and watered down immediately following. Both of these systems worked equally well.

CONCLUSIONS: Plants and flowers suitable for preservation are generally easy to grow. However, this crop is very labor intensive. The stage of growth of the plant at the time of harvest is very critical in order to have a quality end product. Air drying requires an area where temperature and humidity can be controlled. There are various methods of plant production systems that aid in reducing labor, as well as improving quality and yield such as the use of mulches and growing in a bed form. This small observational trial provided information to proceed with other trials on dried flowers aimed at improving production for the grower.

FLOWERING KALE AND CABBAGE 1991

Bev MacPhail, P.Ag., Greenhouse Specialist
Kim Best, Technician

Abstract

Flowering cabbage and kale cultivars were tested to determine their performance and suitability for adding color throughout late fall. All cultivars performed well with the cultivar White Xmas being outstanding.

INTRODUCTION: Flowering kale and cabbage were grown for their interesting color and leaf form which provide color and contrast in the fall. Flowering kale and cabbage may be incorporated into bedding plant production as a transplant in late spring or as a grown plant in early fall. They could offer bedding plant growers new opportunities for fall sales.

MATERIALS AND METHODS: Thirteen cultivars of cabbage and two cultivars of kale were sown in a 128 plug tray on June 10, 1991 in the greenhouse. They were planted outdoors July 22, 1991 spaced 30 cm apart in single 6 meter long rows. A fertilizer application of 17-17-17 was banded at the rate of 672 kg/ha with a sidedressing of 0-0-34 at the rate of 168 kg/ha added on August 29, 1991.

Several plants of each cultivar were planted in 5 liter pots using a soilless compost. They were grown in the greenhouse until August when they were placed in a cold frame.

RESULTS AND DISCUSSION: The outdoor flowering kale and cabbage grew very well filling in the rows quickly. Insect damage throughout the season was minimal with only two spray applications necessary. Irrigation was a necessity due to drought conditions in 1991. Color was evident as nights became cooler and days became shorter. By mid-October color was spectacular. All cultivars performed very well in pots. One exceptional cultivar is White Xmas. Refer to Table 1 for list of cultivars, seed source and description.

CONCLUSIONS: Flowering kale and cabbage provide beautiful color in late fall and could provide bedding plant growers with a new crop for early fall sales. All cultivars included in this trial performed well in 5 liter pots and in the outdoor trials. The trials at the Kentville Research Centre were labelled with good access to the general public and growers.

Table 1: Flowering Kale Varieties 1991

Variety	Seed Source	Color/Type
Coral Queen	Takii	red center; fringed leaved cabbage
Coral Prince	Takii	white center; fringed leaved cabbage
White Kamone	Takii	dwarf; early white coloring; fringed leaved cabbage
Red Kamone	Takii	dwarf; early deep red coloring; fringed leaved cabbage
White Peacock	Takii	white center; deeply notched, pinnate leaved kale
Red Peacock	Takii	red center; deeply notched, pinnated leaved kale
Red Chidori	Takii	dwarf; dark red center; fringed leaved cabbage
Pink Beauty	Takii	early; pink center; round leaved cabbage
White Xmas	Takii	early; white center; round leaved cabbage
Frizzy Red	Parks	very frizzed, lacy leaves with brightly colored red enters
Frizzy White	Parks	very frizzed, lacy leaves with brightly colored white centers
Color Up Mix	Parks	white, pink and red mix; round leaved cabbage
Chidora White	Stokes	white double savoy center with savoyed green outer leaves; fringed leaved cabbage
Chidora Red	Stokes	deep rose-red double savoyed center wth savoyed green outer leaves; fringed leaved cabbage
Rose Bouquet	Takii	early; round leaved cabbage, rosepink center

GREENHOUSE CUCUMBER TRIALS 1991
CULTIVAR OBSERVATION TRIAL

Brian Toms, Horticulturist
Arthur Haskins, Agricultural Technician

Abstract

Six cultivars of greenhouse cucumbers grown in a N.F.T. hydroponic growing system were evaluated for crop production and fruit quality characteristics.

INTRODUCTION: The nutrient film technique (N.F.T.) of growing is a re-circulating system with no losses of nutrient solution to drainage. This system was used for a cultivar evaluation trial involving six greenhouse cucumber cultivars.

MATERIALS AND METHODS: Seeds of six cultivars of greenhouse cucumbers were sown in rockwool cubes on February 15 and set out into the troughs of the N.F.T. system on April 26. Standard growing procedures were used and harvesting commenced on April 26. The trial was terminated on August 30.

RESULTS AND DISCUSSION: Yield and quality information for the cultivars is contained in Table 1. The cultivar 'Aricia' produced the greatest quantity of cucumbers and there was little difference between the remaining cultivars. 'Flamingo' is a cultivar resistant to powdery mildew diseases. This disease was present in the crop from mid-July onward and the cultivar 'Cargo' proved to be the most susceptible. All other cultivars with the exception of Flamingo were eventually infected with this disease.

Table 1: Growing Systems Trial – Spring 1991

	Marketable			Size Grades				
System	Total Fruit/ Plant	Fruit/ Plant	Fruit/ M^2	% Small	% Medium	% Large	% E/Large	% Cull
Aricia	64.2	56.5	84.8	26.2	44.8	15.4	1.6	12.0
002/217	58.2	49.8	74.7	9.7	41.8	31.2	2.8	14.5
Manu	56.5	47.1	70.7	32.5	42.6	8.2	0	16.7
Bronco	56.4	48.7	73.0	25.6	47.4	11.2	0.7	15.1
Cargo	56.3	46.7	70.1	20.7	45.7	16.5	0.5	16.9
Flamingo	53.7	45.0	67.5	33.1	40.5	9.3	0.9	16.2

1.5 plants per m^2

BEDDING PLANT TRIALS

Brian Toms, Horticulturist
Arthur Haskins, Agricultural Technician

Abstract

One-hundred and ninety-six (196) cultivars of popular bedding plants were evaluated during the 1991 growing season. Data was recorded for plant height, plant width and bloom size as well as an overall rating for garden performance.

INTRODUCTION: The regional bedding plant trial involves six sites in Atlantic Canada. The object is to screen available cultivars of selected species and to identify those most suited to the region, thus enabling both producers and consumers to obtain the best plant material available for use in Atlantic Canada.

Additional trials involving cultivars chosen for the All America Selections award and other miscellaneous cultivars are also carried out at the Truro site.

MATERIALS AND METHODS: The bedding plants were raised from seed and grown in a soilless compost in plastic 806 packs or in 10cm pots (geraniums). Initial growth took place in the greenhouse and the trials were planted out in the trial beds during the first week of June. Field evaluations took place at bi-weekly intervals starting on July 5.

RESULTS: A new system of recording was used this year and all cultivars were rated according to the following grades.

E = Excellent
G = Good
F = Fair
P = Poor

Results of these trials are shown in Tables 1-3 inclusive.

DISCUSSION: The 1991 growing season at Truro was hot and dry for the months of June and July. August and September, however, were wetter than average. The early flowering performance of geraniums, petunias and dianthus was exceptional. The snapdragons were good whilst growth of the marigolds suffered in the dry conditions. The rain in August badly effected the petunias and some of the geranium cultivars. The dianthus cultivars performed very well throughout the months of June, July and August.

The All America Selection display garden contained five new cultivars to be released to the industry for the 1992 season. Of these, the verbena cultivar 'Peaches and Cream' gave an excellent garden performance whilst the other new cultivars dianthus 'Ideal Violet', canna 'Tropical Rose', salvia 'Lady in Red' and vinca 'Pretty in White' all rated good for overall garden performance.

The miscellaneous trial (Table 3) included a selection of cultivars from Royal Sluis and, with the exception of phlox, all of these cultivars performed well. The phlox was very slow to establish in the dry conditions and the resulting growth and flowering were very poor.

Seed for the trials was provided by the following companies.

Jack VanKlaveren Ltd. (St. Catherines, Ontario)
Stokes Seeds Ltd. (St. Catherines, Ontario)
Ball Superior Ltd. (Mississauga, Ontario)
Royal Sluis Inc. (Salinas, California)

The All America Selections organization also continued to support the display garden of award winning cultivars.

GREENHOUSE TRIALS RESULTS

The 1991 bedding plant trials included seed geraniums, multiflora petunias, American marigolds, dianthus and snapdragons. Seed for these trials was provided by J.V.K. Ltd., Stokes Seeds and Ball Superior. Results of greenhouse and garden assessment for the Truro trial were as follows.

TABLE 1 - Regional Bedding Plant Trial 1991

BEDDING PLANT TRIALS	GREENHOUSE ASSESSMENT			GARDEN ASSESSMENT						
(MARIGOLDS) CULTIVAR	Germination	Eveness of Growth	Uniformity of Flowering	Floriferousness	Flower Quality	Uniformity of Growth	Disease Resistance	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Voyager Yellow	G	G	P	G	G	G	G	G	G	G
Voyager Orange	G	G	F	G	G	G	G	G	G	G
Voyager Golden Yellow	G	G	P	G	G	G	G	G	G	G
Discovery Yellow	G	G	P	F	G	G	G	G	G	G
Discovery Orange	G	G	F	F	G	G	G	G	G	G
Pumpkin Crush	G	G	F	F	F	G	G	G	G	F
Pineapple Crush	G	G	P	F	F	G	G	G	G	F
Perfection Gold	G	G	P	G	G	G	G	G	G	G
Perfection Yellow	G	G	P	G	G	G	G	G	G	G
Perfection Orange	G	G	P	F	G	G	G	G	G	G
Inca Yellow	G	G	F	G	G	G	G	G	G	G
Inca Gold	G	G	P	G	G	G	G	G	G	G
Inca Orange	G	G	G	F	G	G	G	G	G	G
First Lady	G	G	P	G	G	G	G	G	G	G
Orange Lady	G	G	G	F	G	G	G	G	G	G
Gold Lady	G	G	F	G	G	G	G	G	G	G

E (Excellent) G (Good) F (Fair) P (Poor)

BEDDING PLANT TRIALS

(GERANIUMS) CULTIVAR	GREENHOUSE ASSESSMENT			GARDEN ASSESSMENT						
	Germination	Evenness of Growth	Uniformity of Flowering	Floriferousness	Flower Quality	Uniformity of Growth	Disease Resistance	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Multibloom Lavender	G	G	G	G	F	G	G	G	G	G
Multibloom Red	G	G	P	F	F	G	G	G	F	F
Multibloom White	G	F	P	G	F	G	G	G	F	F
Mulribloom Salmon	G	F	G	G	F	G	G	G	F	F
Multibloom Scarlet	G	G	E	G	F	G	G	G	F	F
Multibloom Pink	G	G	E	G	F	G	G	G	F	F
Multibloom Scarlet/Eye	G	G	E	F	F	G	G	G	F	F
Multibloom Bright Rose	G	G	G	G	F	G	G	G	F	F
Elite Cherry	G	F	G	G	G	G	G	G	G	G
Elite White	G	F	G	G	G	G	G	G	G	G
Elite Scarlet	G	G	G	G	G	G	G	G	G	G
Tiffany	G	G	P	F	G	G	G	G	G	G
Geronimo	G	G	E	F	G	G	G	G	G	G
Pinto Red	G	G	E	G	G	G	G	G	G	G
Pinto White	G	G	G	G	G	G	G	G	G	G
Orange Appeal	G	G	G	G	G	G	G	G	G	G
Orbit Cardinal	G	G	P	G	G	G	G	G	G	G
Elite Salmon	G	G	F	G	G	G	G	G	G	G
Bandit Red	G	G	E	G	G	G	G	G	G	G
Elite Pink	G	G	G	G	G	G	G	G	G	G
Bandit Coral	G	G	G	G	G	G	G	G	G	G
Orbit Deep Salmon	G	F	G	G	G	G	G	G	G	G
Orbit Hot Pink	G	G	G	F	G	G	G	G	G	G
Orbit Light Salmon	G	G	G	G	G	G	G	G	G	G
Orbit Rose	G	F	G	F	G	G	G	G	G	G
Cabaret Red	G	F	P	F	F	G	G	G	F	F
Cabaret Pink	G	F	P	F	F	G	G	G	F	F

E (Excellent) G (Good) F (Fair) P (Poor)

BEDDING PLANT TRIALS

(DIANTHUS) CULTIVAR	GREENHOUSE ASSESSMENT			GARDEN ASSESSMENT						
	Germination	Evenness of Growth	Uniformity of Flowering	Floriferousness	Flower Quality	Uniformity of Growth	Disease Resistance	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Princess Purple	G	G	E	G	G	G	G	G	G	G
Princess Scarlet	G	G	G	G	G	G	G	G	G	G
Princess Crimson	G	G	G	G	G	G	G	G	G	G
White Charm	G	G	P	G	G	G	G	G	G	G
Princess Salmon	G	G	P	G	G	G	G	G	G	G
Rosemarie Salmon	G	G	F	F	G	F	G	G	G	F
Rosemarie Velvet	G	G	G	F	G	F	G	G	G	F
Snowfire	G	G	P	G	G	G	G	G	G	G
Pink Flash	G	G	E	G	G	G	G	G	G	G
Strawberry Parfait	G	G	P	G	G	G	G	G	G	G
Raspberry Parfait	G	G	P	G	G	G	G	G	G	G
Crimson Carpet	G	G	P	F	G	G	G	G	G	G
Oriental Carpet	G	G	P	F	G	G	G	G	G	G
Snow Carpet	G	G	P	F	G	F	G	G	G	F
Fire Carpet	G	G	P	G	G	G	G	G	G	G
Rose Carpet	G	G	P	F	G	G	G	G	G	G
Ideal Carmine	G	G	E	G	G	G	G	G	G	G
Ideal Rose	G	G	E	G	G	G	G	G	G	G
Ideal Crimson	G	G	E	G	G	G	G	G	G	G
Ideal Deep Violet	G	G	E	G	G	G	G	G	G	G
Telstar Picotee	G	G	G	G	G	G	G	G	G	G
Telstar Purple Picotee	G	G	G	G	G	G	G	G	G	G
Telstar Crimson	G	G	G	G	G	G	G	G	G	G
Telstar Scarlet	G	G	F	G	G	G	G	G	G	G
Telstar White	G	G	P	G	G	G	G	G	G	G
Festival Picotee	G	G	G	G	G	G	G	G	G	G

E (Excellent) G (Good) F (Fair) P (Poor)

BEDDING PLANT TRIALS

(PETUNIAS) CULTIVAR	GREENHOUSE ASSESSMENT			GARDEN ASSESSMENT						
	Germination	Eveness of Growth	Uniformity of Flowering	Floriferousness	Flower Quality	Uniformity of Growth	Disease Resistance	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Celebrity Burgundy Ice	G	G	G	G	G	G	G	F	G	G
Celebrity Burgundy	G	G	G	F	G	G	G	F	G	F
Celebrity Raspberry Ice	G	G	G	F	G	G	G	F	G	F
Celebrity Hot Pink	G	G	G	G	G	G	G	F	G	G
Celebrity Blue Ice	G	G	G	G	G	G	G	F	G	G
Celebrity Strawberry Ice	G	G	P	G	G	G	G	F	G	G
Celebrity Summer Ice	G	G	F	G	G	G	G	F	G	G
Celebrity White	G	G	G	G	G	G	G	F	G	G
Celebrity Salmon	G	G	G	G	G	G	G	F	G	G
Celebrity Red	G	G	F	G	G	G	G	F	G	G
Primetime Blue Star	G	G	G	F	F	G	G	F	G	F
Primetime Burgundy Star	G	G	G	F	F	G	G	F	G	F
Primetime Light Blue	G	G	E	G	G	G	G	F	G	G
Primetime Red Star	G	G	G	F	F	G	G	F	G	F
Primetime Rose Star	G	G	G	F	F	G	G	F	G	F
Primetime Blue	G	G	G	G	G	G	G	F	G	G
Primetime Burgundy	G	G	G	G	G	G	G	F	G	G
Primetime Pink	G	G	G	G	G	G	G	F	G	G
Primetime Pink Veined	G	G	G	G	G	G	G	F	G	G
Primetime Light Pink Veined	G	G	G	G	G	G	G	F	G	G
Primetime Plum	G	G	G	G	G	G	G	F	G	G
Primetime Red	G	F	F	F	F	G	G	F	G	F
Primetime Rose	G	G	G	G	G	G	G	F	G	G
Primetime Salmon	G	G	G	G	G	G	G	F	G	G
Primetime White	G	G	G	G	G	G	G	F	G	G
Spring Madness	G	F	G	G	G	G	G	F	G	G
Midnight Madness	G	F	F	G	G	G	G	F	G	F
Orchid Madness	G	G	G	G	G	G	G	F	G	G

E (Excellent) G (Good) F (Fair) P (Poor)

BEDDING PLANT TRIALS

(PETUNIAS) (cont'd) CULTIVAR	GREENHOUSE ASSESSMENT			GARDEN ASSESSMENT						
	Germination	Eveness of Growth	Uniformity of Flowering	Floriferousness	Flower Quality	Uniformity of Growth	Disease Resistance	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Silver Madness	G	G	G	G	G	G	G	F	G	G
Simply Madness	G	G	G	G	G	G	G	F	G	G
White Madness	G	G	G	G	G	G	G	F	G	G
Rose Madness	G	G	G	G	G	G	G	F	G	G
Sheer Madness	G	G	G	G	G	G	G	F	G	G
Summer Madness	G	F	G	G	G	G	G	F	G	G
Burgundy Madness	G	G	F	G	G	G	G	F	G	G
Plum Madness	G	G	F	G	G	G	G	F	G	G
Sugar Madness	G	G	G	G	G	G	G	- F	G	G
Coral Madness	G	G	G	F	G	G	G	F	G	G
Pink Madness	G	G	E	F	G	G	G	F	G	G
Red Madness	G	F	F	P	F	G	G	F	G	F

E (Excellent) G (Good) F (Fair) P (Poor)

BEDDING PLANT TRIALS

(SNAPDRAGONS) CULTIVAR	GREENHOUSE ASSESSMENT			GARDEN ASSESSMENT						
	Germination	Eveness of Growth	Uniformity of Flowering	Floriferousness	Flower Quality	Uniformity of Growth	Disease Resistance	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Floral Showers Bronze	G	G	P	F	G	G	G	G	G	G
Floral Showers Deep Rose	G	G	P	P	G	G	G	G	G	G
Floral Showers Scarlet	G	G	P	P	G	G	G	G	G	G
Floral Showers Lilac	G	G	F	P	G	G	G	G	G	G
Floral Showers Purple	G	G	G	P	G	G	G	G	G	G
Floral Showers Crimson	G	G	P	F	G	G	G	G	G	G
Floral Showers Rose Pink	G	G	P	F	G	G	G	G	G	G
Tahiti White	G	G	P	P	G	G	G	G	G	G
Tahiti Yellow	G	G	P	F	P	G	G	G	G	F
Princess White with Purple Eye	G	G	P	P	G	G	G	G	G	G
Sonnet White	G	G	P	P	G	G	G	G	G	G
Sonnet Yellow	G	F	P	P	G	G	G	G	G	G
Sonnet Pink	G	G	P	P	G	G	G	G	G	G
Sonnet Rose	G	G	F	P	G	G	G	G	G	G
Sonnet Bronze	G	G	P	P	G	G	G	G	G	G
Sonnet Orange Scarlet	G	F	P	P	G	G	G	G	G	G
Sonnet Crimson	G	G	P	P	G	G	G	G	G	G
Sonnet Burgundy	G	G	E	F	G	G	G	G	G	G
Sonnet Carmine	G	G	P	P	G	G	G	G	G	G
Liberty Bronze	G	F	P	F	G	G	G	G	G	G
Liberty Crimson	G	G	P	P	G	G	G	G	G	G
Liberty Light Pink	G	G	P	F	G	G	G	G	G	G
Liberty Scarlet	G	F	P	P	G	G	G	G	G	G
Liberty Yellow	G	G	P	P	G	G	G	G	G	G
Liberty Cherry	G	G	P	P	G	G	G	G	G	G
Liberty Lavender	G	F	P	P	G	G	G	G	G	G
Liberty Rose Pink	G	F	P	P	G	G	G	G	G	G
Liberty White	G	G	P	P	G	G	G	G	G	G

E (Excellent) G (Good) F (Fair) P (Poor)

BEDDING PLANT TRIALS

(SNAPDRAGONS) (cont'd) CULTIVAR	GREENHOUSE ASSESSMENT			GARDEN ASSESSMENT						
	Germination	Evenness of Growth	Uniformity of Flowering	Floriferousness	Flower Quality	Uniformity of Growth	Disease Resistance	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Sprite Orange	G	P	P	P	G	G	G	G	G	G
Sprite White	G	G	P	P	G	G	G	G	G	G
Sprite Cherry	G	G	P	P	G	G	G	G	G	G
Sprite Pink	G	F	P	P	G	G	G	G	G	G
Sprite Yellow	G	G	P	P	G	G	G	G	G	G
Sprite Crimson	G	F	P	P	G	G	G	G	G	G
Sprite Scarlet	G	P	P	P	G	G	G	G	G	G

E (Excellent) G (Good) F (Fair) P (Poor)

TABLE 2 - All America Selections 1991 Trials

VARIETY	Germination	Floriferousness	Flower Quality	Uniformity	Disease Resistance	Tolerance to Sun	Tolerance to Shade	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance
Pansy Jolly Joker	G	F	G	G	G	G	-	F	G	F
Pansy Padparadja	G	F	G	G	G	G	-	F	G	F
Pansy Maxima Marina	G	E	G	G	G	G	-	G	G	E
Celosia Pink Castle	G	G	G	G	G	G	-	G	G	G
Celosia New Look	G	G	G	G	G	G	-	G	G	G
Achillea Summer Pastels	G	F	G	G	G	G	-	G	G	F
Dianthus Ideal Violet	G	G	G	G	G	G	-	G	G	G
Canna Tropical Rose	E	G	G	G	G	G	-	G	G	G
Gaillardia Red Plume	G	E	F	G	G	G	-	G	G	G
Geranium Freckles	F	G	G	G	G	G	-	G	G	G
Verbena Novalis Deep Blue	G	G	G	G	G	G	-	G	F	G
Verbena Sandy White	G	G	G	G	G	G	-	G	F	G
Verbena Peaches & Cream	G	E	G	G	G	G	-	G	G	E
Salvia Lady in Red	E	G	F	G	G	G	-	G	G	G
Coreopsis Early Sunrise	G	G	F	G	G	G	-	G	G	G
Vinca Pretty in Rose	G	G	G	G	G	G	-	G	G	G
Vinca Pretty in Pink	G	G	G	G	G	G	-	G	G	G
Vinca Parasol	G	G	G	G	G	G	-	G	G	G
Vinca Pretty in White	G	G	G	G	G	G	-	G	G	G
Petunia Orchid Daddy	G	G	G	G	G	G	-	F	G	G
Petunia Ultra Crimson Star	G	G	G	G	G	G	-	G	G	G
Petunia Polo Salmon	G	G	G	G	G	G	-	G	G	G
Petunia Polo Burgundy Star	G	G	G	G	G	G	-	G	G	G
Petunia Purple Pirouette	F	F	F	G	G	G	-	F	G	F
Marigold Golden Gate	G	G	G	G	G	G	-	G	G	G
Shasta Daisy Snowlady	G	G	G	G	G	G	-	G	G	G

CODE: E - Excellent G - Good F - Fair P - Poor

TABLE 3 - Miscellaneous Cultivars Trial 1991

VARIETY	Germination	Floriferousness	Flower Quality	Uniformity	Disease Resistance	Tolerance to Sun	Tolerance to Shade	Tolerance to Rain	Tolerance to Drought	Overall Garden Performance	
Alyssum Snow Crystals	G	G	G	G	G	G	-	G	G	G	
Alyssum Minimum	G	G	G	G	G	G	-	G	F	G	
Lobelia Rapid Blue	G	G	G	G	G	G	-	G	G	G	
Phlox Petticoat Pink Shades	G	P	P	P	G	P	-	G	P	P	
Phlox Petticoat Mix	G	P	P	P	G	P	-	G	P	P	
Marigold Champion Flame	G	G	G	G	G	G	-	G	G	G	
Marigold Champion Gold	G	G	G	G	G	G	-	G	G	G	
Marigold Champion Harmony	G	G	G	G	G	G	-	G	G	G	
Marigold Champion Yellow	G	G	G	G	G	G	-	G	G	G	
Cosmos Sonata	E	E	G	G	G	G	-	G	G	G	
Tomato Micro-Tom	E	E	G	G	G	G	-	G	-	G	
Begonia Roxy Scarlet	G	G	G	G	G	G	-	G	G	G	
Begonia Roxy White	G	G	G	G	G	G	-	G	G	G	
Begonia Roxy Rose-Pink	G	G	G	G	G	G	-	G	G	G	
Begonia Lucifer	G	G	G	G	G	G	-	G	G	G	
Begonia Swing Pink	G	G	G	G	G	G	-	G	G	G	
Begonia Swing White	G	G	G	G	G	G	-	G	G	G	
Begonia Swing Scarlet	G	G	G	G	G	G	-	G	G	G	
Begonia Marathon Scarlet	G	G	G	G	G	G	-	G	G	G	
Pelargonium Satellite Scarlet	E	G	G	G	G	G	-	G	G	G	
Pelargonium Satellite Salmon Pink	G	G	G	G	G	G	-	G	G	G	
Pelargonium Satellite Salmon Orange	G	E	G	G	G	G	-	G	G	G	
Pelargonium Satellite Red & White	G	G	G	G	G	G	-	G	G	G	
Pelargonium Satellite Carmine	G	G	G	G	G	G	-	G	G	G	
Pelargonium Challenge Pink	G	G	G	G	G	G	-	G	G	G	
Pelargonium Challenge White	P	-	-	-	-	-	-	-	-	-	
Statice Fortress Apricot	G	G	G	F	G	G	-	G	G	G	
Statice Fortress Dark Blue	G	F	G	G	G	G	-	G	G	F	
Statice Fortress Heavenly Blue	G	F	G	G	G	G	-	G	G	F	
Statice Fortress Purple	G	F	G	G	G	G	-	G	G	F	
Statice Fortress Rose	G	G	G	G	G	G	-	G	G	G	
Statice Fortress White	G	F	G	G	G	G	-	G	G	F	
Statice Fortress Yellow	G	E	G	G	G	G	-	G	G	E	

CODE: E - Excellent G - Good F - Fair P - Poor

GREENHOUSE TOMATO TRIALS 1991

Brian Toms, Horticulturist
Arthur Haskins, Agricultural Technician

Abstract

Two greenhouse tomato cultivars were grown in a trial to compare the nutrient film technique (N.F.T.) with re-circulating systems using perlite and granular rockwool as rooting media.

INTRODUCTION: A modified N.T. (nutrient film technique) system used in a previous trial for cucumbers had shown an increased yield for that crop. This trial was designed to investigate the possible beneficial effects of modified N. F.T. systems for tomatoes.

MATERIALS AND METHODS: This trial used the three double rows of plants in the centre of a 7.5m x 13.5m greenhouse and compared three re-circulating hydroponic systems.

System A N.F.T.

System B 6-litre bags filled with perlite and placed in troughs

System C As System B but with granular rockwool in place of perlite

Seed of two cultivars was sown in rockwool plugs on January 10, moved to rockwool cubes on February 1 and placed out in the growing systems on March 1. A standard nutrient solution was used for all three systems. Harvesting commenced on May 15 and continued until the trial was terminated on August 16.

RESULTS AND DISCUSSION: The results from this trial are shown in Table 1 and 2. The N.F.T. and rockwool growing systems were slightly better than the perlite in terms of yield, quality and fruit size. The cultivar comparison also resulted in little difference, both varieties performing well.

Table 1: GreenhouseTomato Trials 1991

A. Growing Systems

Growing System	Yield kg per plant*	Yield kg per m^2	% Cull	Size (gms)
N.F.T.	6.15	18.45	6.6	220
Perlite Bags	6.05	18.15	7.3	208
Rockwool Bags	6.19	18.57	6.9	213

3 plants/m^2

Table 2: Greenhouse Tomato Trials 1991

B. Cultivar Comparison – Average of 3 Growing Systems

Cultivar	Yield kg/plant	Yield kg per m^2	% Cull	Fruit Size (gms)
Trend	6.19	18.57	7.8	218
Capello	6.07	18.21	6.1	210

Seed Sources: Capello, Trend(DeRuiter)

GREENHOUSE TOMATO CULTIVAR EVALUATION 1991

Brian Toms, Horticulturist
Arthur Haskins, Agricultural Technician

Abstract

Four cultivars of greenhouse tomatoes were compared with the widely used cultivar 'Caruso' in 1991. All were grown in a N.F.T. hydroponic growing system.

INTRODUCTION: Two new fusarium crown and root rot resistance (FCCR) cultivars were compared with three non-resistant cultivars including 'Caruso', a widely grown greenhouse cultivar.

MATERIALS AND METHODS: Seed was sown on January 10 and the young plants were placed out in the cropping house (outside rows) on March 1. A standard N. F.T. hydroponic growing system was used. Harvesting commenced on May 15 and the trial was terminated on August 16.

RESULTS AND DISCUSSION: The results from this trial are contained in the following table. The FCCR resistant cultivars 'Furan' and '2419/88' both outyielded the standard 'Caruso' whilst 'Belmondo' and 'Largetto' were intermediate in performance. The fruit size of 'Furan' and 'Largetto' was somewhat smaller than the other cultivars. The cultivar '2419/88' because of its superior yield and good fruit size as well as its disease resistance is worthy of further trials in comparison with the cultivar 'Trend' which is currently used where fusarium crown and root rot resistance is required.

Table 1: Cultivar Evaluation Trial

Cultivar	kg/plant*	kg per m^2	% Cull	Fruit Size (gms)
Belmondo	6.58	23.0	15.6	240
Caruson	6.09	21.3	13.5	244
Furan	6.67	23.3	7.9	208
Largetto	6.34	22.2	19.3	211
2419/88	6.83	23.9	17.8	241

*3.5 plants/m^2

Seed Sources: Caruso, Furan (DeRuiter);
Belmondo, Largetto, 2419/88 (Bruinsma)

PERENNIAL RYEGRASS SCREENING TRIAL

Bill Thomas, Provincial Forage Specialist

Abstract

Two perennial ryegrass cultivar screening trials are being carried out at Truro by the Nova Scotia Department of Agriculture. One trial, planted in 1991, contains sixteen forage type cultivars seeded in single row plots. The other trial, seeded in 1990, contains thirteen ag-turf type cultivars seeded in 1.5m x 5m plots. The ag-turf were thought to be superior in winterhardiness to the the forage type cultivars. However, the standard forage type cultivar Norlea displayed greater winterhardiness and produced higher dry matter yields than any of the ag-turf types under test.

INTRODUCTION: The Nova Scotia Department of Agriculture is responsible for perennial ryegrass (loloium perennial) cultivar evaluation in the Maritimes. Since 1986 the department has screened approximately 150 cultivars for adaptability. The screening and testing program has identified at least four cultivars that are as good as or slightly better than the standard Norlea. To date two of the four cultivars have been added to the recommended list of forage cultivars for Atlantic Canada: Bastion and Gunne. However, neither of these cultivars displays the degree of winterhardiness required for general recommendation. At present there are two perennial ryegrass screening trials being conducted in Truro by the Nova Scotia Department of Agriculture. One trial, conducted in co-operation with Agriculture Canada, Charlottetown, involves screening turf and ag-turf type cultivars for regional adaptability and suitability for forage. Generally turf type perennial ryegrasses are known to have greater winterhardiness than most forage type cultivars. The other screening trial contains sixteen forage type cultivars being screened for winterhardiness and disease resistance.

MATERIALS AND METHODS: The sixteen forage type cultivars were seeded in 1991 in a single row plots, in a randomized complete block design with four blocks. The single row plots are 5 meters long and were seeded with a rod row seeder. Plots were fertilized with 18-6-18 @ 400 kg/ha prior to seeding and July 9 and August 16 with 34-0-0 @ 150 kg/ha. Plots will be ranked for winterhardiness and disease symptoms. Yield estimates will be taken using a Haldrup forage plot harvester by cutting a 1.5 meter swath across the plots in 1992.

FORAGE TYPE PRG SCREENING TRIAL

1) Dakota	5) 8505	9) ELP24	13) Profit	17) Norlea(Standard)
2) Globe	6) 8412	10) Ledacta	14) EER 835	
3) Labrador	7) 8413	11) Bonita	15) Merbo	
4) 8519	8) 8520	12) ER 400	16) Prior	

The ag-turf type cultivars were seeded in 1989 in 1.5 x 5 meter plots in a randomized complete block design with three blocks. Plots were fertilized with: 18-6-18 @ 400 kg/ha April 25, 34-0-0 @ 150 kg/ha July 9, and 34-0-0 @ 150 kg/ha Aug. 16.

Plots were harvested with a Haldrup plot harvester on June 17, July 15, and Oct 15.

RESULTS AND DISCUSSIONS: The drought in June and July reduced yields to one third what was harvested the previous year. Perennial ryegrasses are a shallow rooted specie and are therefore susceptible to drought stress. The forage type standard Norlea outperformed all the ag-turf types under test at Truro. In a similar trial being conducted at Charlottetown Research Station, Norlea was the top producer as well. Norlea also got the highest persistence ratings at Truro and Charlottetown.

Ag-Turf P.R.G. Screening Trial 1991

	Spring Vigor (1 poor) (10 best)	Yields kg/ha				
		May 31	June 26	Aug 8	Oct 25	TOTAL
Manhattan II	6	531	1489	356	1545	3921
Fiesta II	5.5	385	1247	383	1373	3388
Norlea	7.25	562	1496	895	1747	4700
Dasher	4.5	330	1271	463	1649	3713
Gator	5	307	1344	424	1340	3415
Barry	5	316	1141	645	1530	3632
Yorktown II	4.75	337	1354	496	1526	3713
Omega II	2.75	193	990	668	1683	3534
Palmer	5.25	395	1344	477	1508	3724
Repell	5	268	1265	423	1499	3455
Frances	1	121	905	1145	1377	3548
Blazer II	4.75	432	1287	396	1377	3492
Pennant	5.5	452	1297	342	1629	3720
Mean		.36	1.25	.49	1.47	3.58
SEM		.076	.105	.102	.132	.210
% CV		42.34	16.78	41.42	17.94	11.75

ANNUAL RYEGRASS - LEGUME MIXTURE TRIAL

Bill Thomas, Provincial Forage Specialist

Abstract

Annual ryegrass was grown in mix with three different clovers: Persian, Alsike and Crimson, to compare with annual ryegrass grown alone at two different fertiliser rates for yield and quality performance. Precipitation during the growing season was much less frequent than normal. Under the given conditions all three clover ryegrass mixtures out yielded the straight annual ryegrass plots. The Persian and Alsike clover/annual ryegrass mixtures yielded the highest followed by Crimson Clover/annual ryegrass, annual ryegrass high nitrogen and annual ryegrass low nitrogen.

INTRODUCTION: Annual ryegrass has proven to be well adapted to the climate and soils of Nova Scotia. The principle use of annual ryegrass is for supplementing pastures from mid summer to late fall. Annual ryegrasses are also used in rotations with crops such as potatoes to increase soil organic matter, improve soil structure, and reduce erosion.

The key to high yields of annual ryegrass is adequate soil fertility. As a straight grass it is essential that regular applications of nitrogen be applied throughout the growing season. The amount of nitrogen required is dependent on the manure applied prior to seeding. However, annual ryegrass may be grown with forage legumes to greatly reduce nitrogen fertilization requirements. Work at Agriculture Canada, Charlottetown, has shown that a legume-ryegrass mixture without any nitrogen fertilizer can obtain yields up to 84% of those obtained with nitrogen fertilized ryegrass.[1]

Of the legumes tried to date, (Red Clover, alfalfa, Persian Clover, and birdsfoot trefoil) Persian Clover-ryegrass mix has given the highest yields . However, no work has been done with Alsike Clover in association with annual ryegrass. Alsike is noted for its very aggressive growth in the seeding year and seed costs are comparatively low. A trial was initiated to investigate the performance of Alsike in comparison to Persian and Crimson clovers in mixture with annual ryegrass.

MATERIALS AND METHODS: The following mixtures were seeded May 17, 1991 in a small plot replicated experiment using a randomized complete block design.

[1] Italian and Westerwolds Ryegrasses Performance, Management, and Use. Publication No. 136

Table 1

Treatment #	Mixture	Seeding Rates	N Fertiliser Applied
1	Annual Ryegrass (Maris Ledger)	35 kg/ha	120 kg/ha
2	Annual Ryegrass (Maris Ledger)	35 kg/ha	20 kg/ha
3	Annual Ryegrass (Maris Ledger) Alsike Clover	35 kg/ha 5 kg/ha	20 kg/ha
4	Annual Ryegrass (Maris Ledger) Crimson Clover	20 kg/ha 23 kg/ha	20 kg/ha
5	Annual Ryegrass (Maris Ledger) Persian Clover	20 kg/ha 7.5 kg/ha	20 kg/ha

Individual plots were 1.5 x 5 meters. Plots containing clover-ryegrass mixtures were fertilized prior to seeding only, with 5-10-30 400 kg/ha. Straight ryegrass plots received one of two treatments: 5-10-30 400 kg/ha applied prior to seeding only, or 17-17-17 300 kg/ha at seeding and again July 9. The plots were harvested three times over the season: June 17, July 15 and October 15. Botanical separations for the determination of specie composition was performed on the June and October harvests. (Table 2).

RESULTS AND DISCUSSIONS: The drought conditions of June and July had a profound affect on the results of this experiment. Yields on the straight annual ryegrass plots fertilized with 120 kg N per hectare was only 3 tonnes/ ha for the season, a third of what would be expected under normal rainfall condition. (Table 3) All the clover mixture plots (trt# 3,4,5) out performed both straight ryegrass plots (trt# 1,2) in total yield. Legumes are deeper rooted than annual ryegrass and therefore less drought sensitive. This was most evident at the July 15 harvest when the clover/ryegrass mixtures outyielded the straight grass plots by a factor of three. The benefit of adding clover to the ryegrass was higher yields at a fraction of the cost in fertilizer in 1991.

The period in the season when each clover performed best was different. The Crimson Clover was very fast to establish, allowing the Crimson Clover annual ryegrass plots to out yield all other combinations at first cut. However, little of the Crimson Clover survived the first clipping. The Persian Clover and the Alsike Clover were slower to establish, but produced

well in midsummer giving those mixtures greater yields than all other mixtures at second cut. The persian clover-ryegrass mixture outyielded all other treatments in the October harvest, resulting in the highest yield over three cuts. (Table #3) By season end however, Alsike outperformed all the other clovers in its contribution to the mixture, making up over 80% of the harvested dry matter in October versus 25% for persian clover. This trial needs to be repeated another year. The performance of the clovers and ryegrass must be tested in a year with more normal rainfall frequencies before general recommendations can be made.

Table 2

TRT #	Mixture	% Composition July 19			% Composition October 25		
		Clover	Grass	Weeds	Clover	Grass	Weeds
1	Annual Ryegrass (high nitrogen)	1	56	43	20	80	0
2	Annual Ryegrass (low nitrogen)	0	66	34	0	100	0
3	Annual Ryegrass Alsike Clover	6	60	34	83	17	0
4	Annual Ryegrass Crimson Clover	37	26	37	4	96	0
5	Annual Ryegrass Persian Clover	10	38	52	25	75	0

Table 3

Trt #	Mixture	Fertilizer N Applied Kg/ha	Dry Matter Yield (t/ha) Cut 1 June 17	Cut 2 July 15	Cut 3 Oct 15	Total
1	Annual Ryegrass (Maris Ledger)	120	2.02	0.71	0.25	2.99
2	Annual Ryegrass (Maris Ledger)	20	1.77	0.55	0.24	2.55
3	Annual Ryegrass (Maris Ledger) Alsike Clover	20	1.75	2.20	0.29	4.25
4	Annual Ryegrass (Maris Ledger) Crimson Clover	20	2.26	1.95	0.23	4.44
5	Annual Ryegrass (Maris Ledger) Persian Clover	20	1.88	2.55	0.44	4.87
	Mean		1.94	1.59	0.29	3.82
	Sem		0.12	0.44	.07	.58
	F Prob		<0.01	<0.01	<.01	<.01
	& CV		6.29	27.38	25.14	15.29

DEMONSTRATION OF VARIOUS PERENNIAL PASTURE MIXTURES (A.L.F.I. # TT136)

Jack van Roestel, P.Ag., Crops Extension Specialist

Abstract

A long-term demonstration was set up in 1989 to evaluate various perennial pasture mixtures on an imperfectly drained, clay loam soil near Curry's Corner, Hants County. One mixture per year will be planted from 1989–91, with measurements of pasture yield, quality, and palatability observations noted over a four-year period.

In May of 1989, a mixture of Sonja white clover/Climax timothy/Venture reed canarygrass was seeded at 16 kg/ha. In 1990, a second mixture of Sonja white clover/Frode orchardgrass/Mimer meadow fescue was seeded at 22 kg/ha. This year the final mixture of Sonja white clover/Kay orchardgrass, and Bastion perennial ryegrass was seeded at 20 kg/ha. Although, various observations have been noted, it's a bit too early to draw conclusions with another evaluation year needed.

INTRODUCTION: This A.L.F.I. project will attempt to increase the pasture productivity, livestock performance and dollar return/unit of area through utilizing superior perennial mixtures and demonstrating sound grazing management practices.

Quality forage from pasture can play an enormous role in the profitability of mid-size dairy operations in Nova Scotia. With the fairly recent availability of several new varieties/species, it's intended that this project and other "on-farm" evaluations will serve an important role in measuring long term yield, grazing acceptability and persistence on a heavy clay loam soil.

MATERIALS AND METHODS: Three different pasture mixtures are to be seeded on 0.5–1.5 hectare demonstration areas during the spring of 1989–91. These mixtures consist of the following varieties and species...

1989 – Sonja white clover (15%), Climax timothy (35%), and Venture reed canarygrass (50%) seeded at 16 kg/ha.

1990 – Sonja white clover (10%), Frode orchardgrass (30%), and Mimer meadow fescue (60%) seeded at 22 kg/ha.

1991 – Sonja white clover (15%), Kay orchardgrass (35%), and Bastion perennial ryegrass (50%) to be seeded at 20 kg/ha.

All plots were prepared by fall moldboard plowing and spring secondary tillage. Prior to seeding, 200-300 kg/ha of 17-17-17 was broadcast and incorporated. Seeding was done with a 3m Brillion forage seeder. Early clipping was practiced to achieve weed control. Pasture yields in 1991 were calculated from harvesting the forage under three - 1 meter pasture cages, and recording cow grazing days. Samples were sent to the N.S. Feed Testing Lab for an analysis of quality.

RESULTS AND DISCUSSION: The new 1991 mixture was not seeded until mid-June because of other work commitments on the farm. After seeding, a droughty late June-September

period followed. This delayed germination and early growth considerably, however, come October, this field displayed a good establishment and one very lush grazing for the herd before winter (3,200 kg/ha of Dry Matter).

The 1989 and 1990 seeded plots were difficult to get meaningful yield figures on, because of the extreme droughtiness during the season. The yields that were measured under the pasture cages, were not entirely utilized by the herd because of the stressed forage growth not being overly palatable. It is for this reason of improper forage growth, some pasture clipping and insufficient release of soil nutrients, that the depressed yields occurred, and discrepancies between the pasture cage and animal grazing day measurements occurred.

The 1989, predominately reed canarygrass paddock yielded only about 1780–3100 kg/ha of Dry Matter. With little of the more palatable white clover and timothy species left in this mixture, the cows were not very enthused about the reed canarygrass alone. Although, the productivity of reed canarygrass is impressive in a season with normal moisture, the animal's utilization of this forage can be quite low.

The 1990, white clover/meadow fescue/orchardgrass mixture proved to be very palatable to the herd, although weed problems (i.e. particular thistles) have robbed some productivity. Yields on this paddock, for 1991, were 2300–4600 kg/ha of Dry Matter.

CONCLUSIONS: With the droughty 1991 grazing season and suppressed pastures' performance now behind us, the co-operators are looking forward to a productive year in 1992, where the true value of each mixture can be measured properly. In 1992, all three (3) mixtures will now be established and some good yield figures should be generated.

From a palatability standpoint, both the 1990 and 1991 established mixtures are highly preferred over the native grasses and especially the reed canarygrass.

ACKNOWLEDGEMENT: Thanks to the A.L.F.I. Program and Hustins' for their contributions to this project.

EVALUATION AND MANAGEMENT OF ROTATIONAL GRAZING ON IMPROVED AND NATIVE PASTURE FOR BEEF PRODUCTION

ALFI PROJECT # TT166

Peg Cummings, Crop Specialist

Abstract

Three adjacent 6 ha sites were established at the Mira Community Pasture in 1990 to demonstrate pasture management techniques. Site 1 contained continuous grazing of native pasture and site 2 rotational grazing of native pasture with electric fencing (six 1 ha paddocks). Site 3 was established in 1990 with an orchard grass-meadow fescue-white clover pasture mix and was also divided into six 1 ha paddocks with electric fencing. Rotational grazing was introduced on this site in 1991.

The second year of this project was again affected by drought, but the addition of a clean water source improved animal performance over that of 1990. Grazing days were increased to 91 from 77, and could have been extended even further for the rotationally grazed sites. There were not enough steers and heifers available for the project and carrying capacity was maintained with the addition of cow and calf units.

Rotational grazing resulted in increased animal and forage productivity. Higher forage quality in rotational grazing on native pasture comparable to continual grazing resulted in higher average daily gains, and total beef production. The combination of the productive grass-legume pasture mix and rotational grazing in site 3 (rotational grazing on seeded pasture) yielded more forage, forage quality, and beef production than either site 2 or site 1.

Rotational grazing of the seeded pasture mix resulted in higher ADG (1.09 kg/day vs. 94 vs. 83), gain/head (98 kg/hd vs. 86 vs. 75), kg beef/ha (240 kg/ha vs. 185 vs. 165), total kg beef produced (144 kg vs. 1107 vs. 1059) and carrying capacity (2.60 au/ha vs. 1.96 vs. 2.03) than rotation native grass grazing and continuous native grass grazing respectively.

INTRODUCTION: The primary objective of this project is to demonstrate pasture management techniques that will enhance forage yield and to compare animal productivity on native grass and seeded legume/grass pastures.

Combining the concepts of pasture management and grazing management, results in greater animal and forage efficiency and productivity. Pasture management is achieved through the use of lime, fertilizer, and pasture seed mixtures. Increasing pH with lime use makes any fertilizer used far more efficient and effective. Fertilizing to increase or maintain P & K levels, results in productive forage growth, greater legume persistence, and fewer weeds, which lower the quality and quantity of pasture. Maintaining a 30% stand of white clover is the equivalent of 200 kg/ha N.

Grazing management is achieved through rotational grazing by adjusting the number of grazing animals, how long and how often they graze a particular area. This results in more grass for consumption, supports more animals/ac and ultimately produces more pounds of beef/ac. Also, the total grazing period is extended and the stress of mid summer grazing is alleviated when pasture decline is usually rapid.

MATERIALS AND METHODS: With the cooperation of the Mira Community Pasture Cooperative, 18 ha of native pasture was reserved from the main body of 200 acres of pasture. The site was further sub-divided into 3 adjacent 6 ha pastures. Treatment of the sites are as follows:

Site 1 - Continuous Grazing Native Pasture (6.4 ha)

Received: 5.0 t/ha lime	Early May 1991
400 kg/ha 12-24-24	Early May 1991
135 kg/ha 34-0-0	August 8, 1991

— Pasture Clipped Late July

Site 2 - Rotational Grazing Native Pasture (six 1.0 ha paddocks)

Received: 5.0 t/ha lime	Early May 1991
400 kg/ha 12-24-24	Early May 1991
100 kg/ha 34-0-0	July 25, 1991
125 kg/ha 34-0-0	August 8, 1991

— Pasture Clipped late July

Site 3 - Rotational Grazing on Seeded Grass-Legume Pasture (Six 1.0 ha paddocks)

Received: 5.0 t/ha lime	Early May 1991
250 kg/ha 12-24-24	Early May 1991
50 kg/ha 34-0-0	July 25, 1991
100 kg/ha 34-0-0	August 8, 1991
150 kg/ha 0-0-60	Fall 1991

— Pasture Clipped late July

Three strand electric fence was installed to separate the two pasture sites. Existing page wire fence was utilized for perimeter fencing. Two strand electric fence was used to make six 1.0 ha paddocks in site 2 and 3 (Rotational Grazing).

The stocking rate for the project was determined using the Voisin formula. Due to a shortage in the number of steers and heifers required for the project, cow and calf groups were used to fill in the animal units required to achieve the set stocking rate of 16 animal units (equal to 14 steers and heifers, 4 cow and calf). For beef production figures, only the weight gains from the steers and heifers were used. Cow and calf units were taken into account only in reporting the carrying capacity of the pastures. All animals were treated with Ivomec prior to going on pasture in June.

Due to the cold, very dry spring in 1991, grass growth was very slow and grazing was delayed to mid June.

The project ended in mid September when cattle prices were good and the owners anxious to sell. Some cattle stayed on the grazing sites until late October. Observations in mid September revealed that site 1 had very little feed left for grazing. Site 2 sustained growth until early October, while site 3 maintained the greatest grass growth and production until late October.

Data was taken on a regular bi-weekly basis for all three sites throughout the growing season. Data collected included forage yield, forage quality, sward heights, weed analysis, and soil sampling. Animal production figures, based on beginning, mid season, and final weighings over a 91 day grazing period include; average daily gain, gain per head, production of beef per ha, and animal units per ha.

RESULTS AND DISCUSSION:

Dry Matter Yields (Figure 1)

Rotationally seeded pasture dry matter yields declined from 4 t/ha at the beginning of the grazing season until mid July. At this time, moisture finally arrived and yields were maintained throughout the rest of the season of approximately 1.8 t/ha. Yields averaged about 400 kg/ha more from early August to late September, therefore, providing more feed and supporting more animal units than either the continuous or rotationally grazed native pastures.

Rotationally grazed native pastures declined very rapidly from a starting level of 3 t/ha to a low of .9 t/ha in early August. Moisture and re-fertilization with nitrogen (ammonium nitrate) increased yields to 1.4 t/ha which was maintained until mid September when yields started to decline again.

Continuously grazed pasture yields declined from 2.9 t/ha to .9 t/ha in mid September. From mid August until early September, both native grass treatments maintained approximately the same yields at 1.4 t/ha. However, the continuously grazed pasture declined rapidly after early September and certainly would not support animals for any length of time after this period.

Crude Protein Levels (Figure 2)

Crude protein levels declined early in the season for all three pastures. With the addition of fertilizer in late July, crude protein levels increased for all three pastures. However, the continuously grazed pasture started to decline in late August, while the rotation grazed pastures steadily increased. Protein levels throughout the season were more than sufficient for animal growth.

Due to the high legume content, crude protein levels in the rotational seeded pasture were higher throughout the majority of the season than the native grazed pastures. Up to mid July, levels were 5% higher, increasing to 11% until mid August with the continuous grazing.

Rotationally grazed native pasture also maintained higher crude protein levels throughout the season than continuous grazing, due to extra fertilizer applications.

TDN Levels (Figure 3)

TDN (energy) levels declined steadily for all three pastures early in the season. By mid July, the rotationally grazed pastures maintained fairly steady energy levels, while the continuously grazed pasture steadily declined until mid August. At this time, after a mid season, clipping energy levels increased sharply, with all three declining again in early September.

Energy level differences were 3% for much of the season between the rotational native pasture and the rotational seeded pasture. The continuous pasture was as much as 10% lower in energy from mid July to mid August, but maintained a higher level than the native rotation during the last three weeks of grazing.

Average Daily Gain (Figure 4)

ADG was similar during the beginning of the grazing period for all three pastures. During the mid to late summer period, ADG declined from 1.02 kg/ day to .67 kg/day for a season

average (91 days) of .83 kg/day (1.82 lb)/ day for continuously grazed animals. Rotational native grazed animals gain in the mid summer period from .88 kg/day to .99 kg/day for a season average of .94 kg/day (2.07 lb/day). Rotational seeded pasture animals also gained during the mid summer from 1.00 kg/day to 1.2 kg/day, averaging 1.09 kg (2.40 lb/day) for the season.

Gain/Head (Figure 5)

Rotational grazing of the seeded pasture yielded a 98 kg (216 lb) gain/head, while rotational native grass grazing yielded a 86 kg (190 lb) gain/head for the season. Continuously grazed animals had the lowest gain/head at 76 kg (166 lb).

Total Beef Production (Figure 6)

Rotational grazing of seeded pasture had the highest production of all three grazing systems yielding 144/kg (3170 lb) or 240 kg/ha of beef.

Animal Units/ha (Figure 7)

Rotational grazing of native pasture produced 1107 kg (2435 lb) or 185 kg/ha of beef, while continuously grazed pasture yielded the lowest beef production of 1060 kg (2330 lb), equal to 165 kg/ha beef.

Each of the three pasture sites supported an approximately equal number of animals at the beginning of the season, which later decreased slightly for both continuous and native rotational grazing, and increased with rotational seeded pasture grazing. On average over the season, the continuous grazed pasture had a carrying capacity of 2.03 au/ha, which means that each ha supported 14 steers and heifers and 2 cow and calf. Rotational native grazing carried 1.96 au/ha (13 steers and heifers, and 2 cow and calf, while rotational seeded grazing carried a greater number of animals at 2.60 au/ha (16 steers and heifers, 4 cow and calf) over the season.

CONCLUSION: In comparing continuous grazing and rotational grazing of cattle on pasture, rotational grazing results in higher animal and forage productivity.

Rotation grazing on native pasture out-produced continuous grazing on native pasture in forage quality, resulting in higher ADG and higher total beef production, even though carrying capacity was slightly less with the rotation grazing.

Rotational grazing on the seeded pasture mix out-produced both native pasture grazing systems in forage yield, forage quality, ADG, total beef production and carrying capacity.

The combination of the productive grass-legume pasture mixture and rotational grazing produced 55 kg/ha more beef and 334 kg more total beef than rotational native grazing. It also out-yielded continuous grazing beef productions by 75 kg/ha and 381 kg total beef.

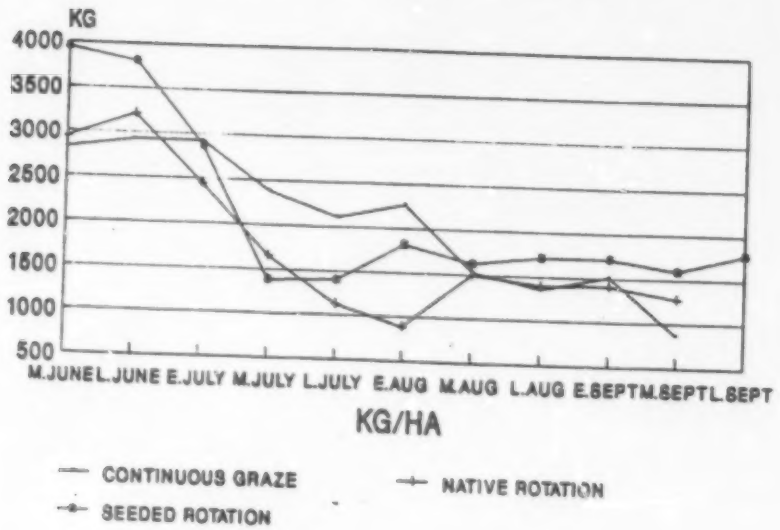
Rotational grazing has been shown to produce more meat and grass than continuous grazing. Total cost and cost/lb. of gain are currently being evaluated.

TABLE 1

MIRA PASTURE GRAZING PROJECT
Year Comparison of Production

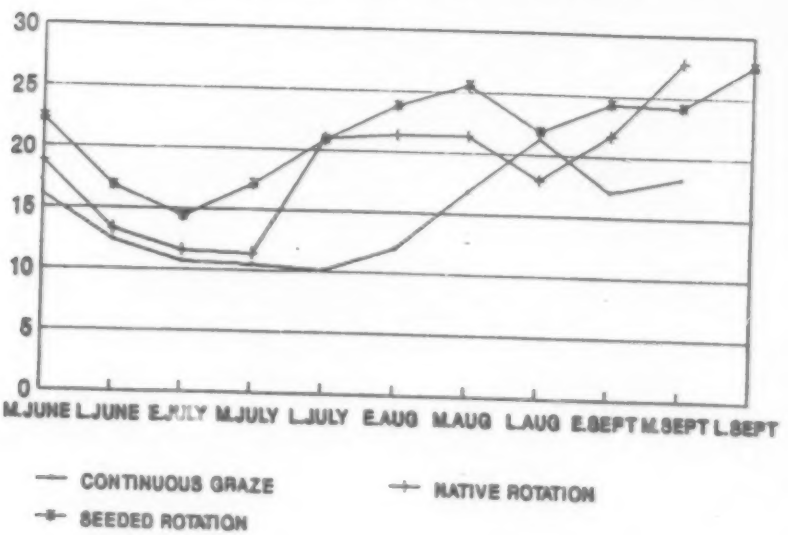
	Days Grazing	ADG Kg	Gain Kg/head	Beef Production Kg/ha	Beef Production Total Kg	Total AU/ha
Continuous Grazing						
1990	77	.63	49	131	836	2.38
1991	91	.83	75	165	1059	2.03
Rotation Native						
1990	77	.93	70	259	1555	2.75
1991	91	.94	86	185	1107	1.96
Rotation Seeded						
1990	–	–	–	–	—	—
1991	91	1.09	98	240	1441	2.60

FIGURE 1
DRY MATTER YIELDS



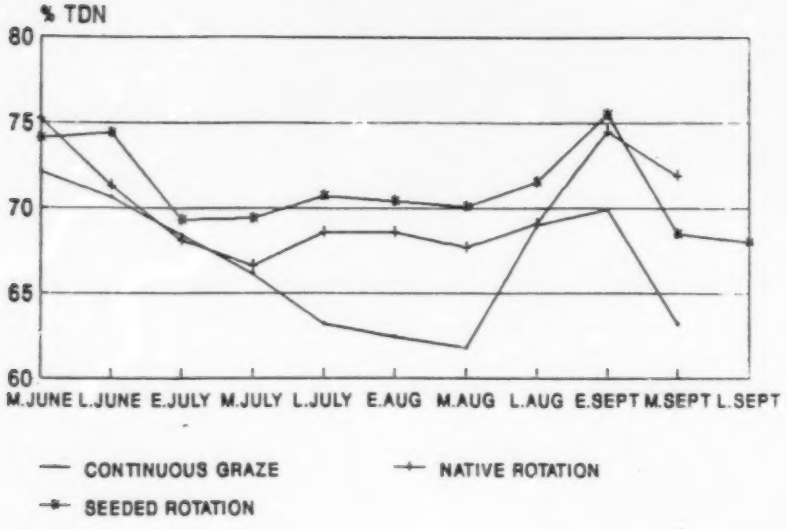
1991

FIGURE 2
CRUDE PROTEIN LEVELS



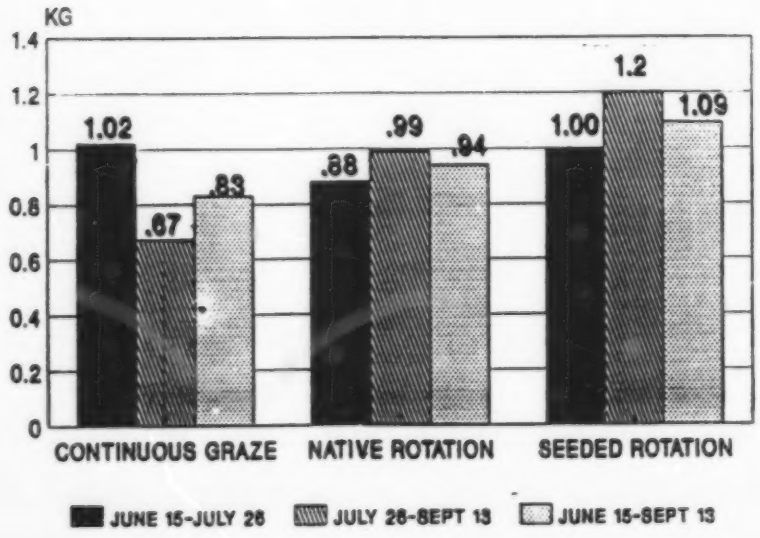
1991

FIGURE 3
TDN LEVELS



1991

FIGURE 4
ADG OVER SEASON



1991

FIGURE 5
GAIN/HEAD

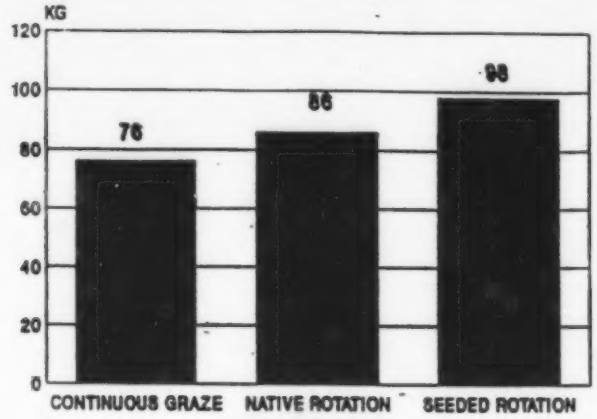


FIGURE 6
TOTAL BEEF PRODUCED

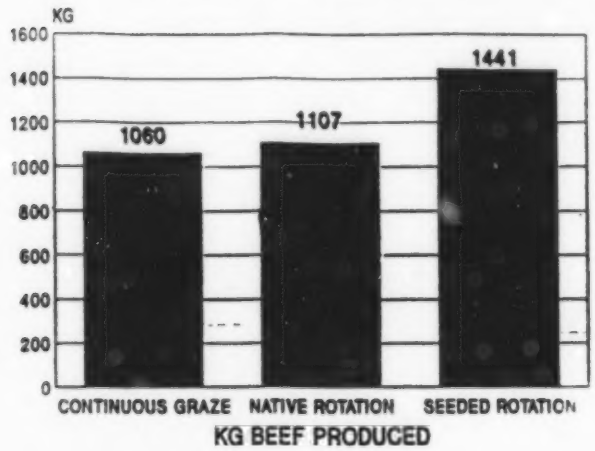
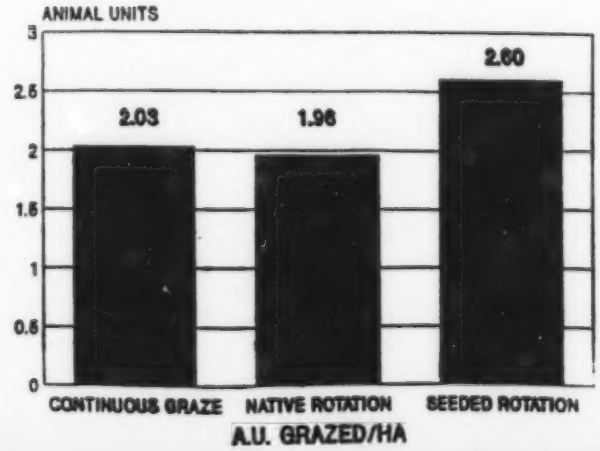


FIGURE 7
ANIMAL UNITS/HA



FORAGE ESTABLISHMENT DEMONSTRATION

Eric Bosveld, Soil and Crop Specialist
Bill Thomas, Provincial Forage Specialist

Abstract

A forage establishment demonstration was seeded in 1989 to evaluate various methods of establishing an alfalfa/timothy stand. The treatments consisted of: 1) direct seeded with a Brillion, 2) direct seeded with grain drill, 3) barley at 75 kg/ha underseeded to forage and harvested as forage, 4) barley at 180 kg/ha, underseeded to forage and harvested as forage, 5) same as 3, only was harvested as grain, and 6) same as 4 only barley was harvested as grain. The nurse crops harvested as forage had twice the forage yield as the direct seeded treatments in the establishment year 1989. Barley harvested as grain reduced 1st production year (1990) forage yields, especially at the higher rate. Highest first cut yields were achieved by the direct seeded treatments in the first production year, however much of this advantage was masked by the time the 2nd cut was harvested. Yields in 1991 were less than half the expected amount due to extremely dry conditions . Percent alfalfa in each treatment, measured in 1991, was highest in the direct seeded plots and lowest in barley harvested as grain.

INTRODUCTION: There are a number of methods farmers use to establish forage mixtures. From underseeding barley and oats that are harvested as grain or haylage, to direct seeding using no nurse crop. The method used is often determined by the need for grain, the absence of a sprayer, or the desire for high forage yields during the establishment year and not which method will result in the most productive forage crop. In order to demonstrate and compare the affect the various methods of establishment have on the performance of a forage crop during the production years a strip trial sponsored by the Central Nova Soil and Crop Improvement Association was set up on the farm of Frank and Audrey MacKenzie, Upper Stewiacke.

MATERIALS AND METHODS: In 1989, an unreplicated strip trial was set up with the treatments listed in Table 1. The site selected had a well drained and deep sandy loam soil with gravelly sections. Two rates of barley were used to determine the advantage of increasing the seed rate when harvested as a forage or when left for dry grain. In 1989, P and K were applied according to soil test and lime was incorporated before seeding. Both a Brillion and a grain drill were used to direct seed the alfalfa to determine whether there were any advantages in yield due to seeding method.

In 1990 and again in 1991, the effect of the various establishment methods on yields were evaluated. Yields were sampled by mowing the plots (one acre approximately) and by weighing the forage harvested with highway scales as they were loaded into the silo. In 1991 only, ten one-quarter metre square samples were clipped from each treatment and botanically separated for the determination of alfalfa content.

Table 1: Forage Establishment Treatments

Trt. No.	* Code	Seeder	Alf/Tim (kg/ha)	**Barley (kg/ha)
1	DSB	Brillion	22	0
2	DSD	Drill	22	0
3	LBF	Drill	22	75
4	HBF	Drill	22	180
5	LBG	Drill	22	75
6	HBG	Drill	22	180

* DSB - Direct Seed Brillion
DSD - Direct Seed Drill
LBF - Low(rate)Barley Forage
HBF - High Barley Forage
LBG - Low Barley Grain
HBG - High Barley Grain

** The barley was seeded at the indicated rates and harvested as forage in treatments 3 and 4 and as grain in treatments 5 and 6.

Fertilizer was applied at 400 kg/ha of 5-20-20 + .2B in the spring and 0-0-60 at 200 kg/ha after 1st cut. Soil Test analysis indicated M+ levels of P and K with a pH of 6.8.

RESULTS AND DISCUSSION: The yield results are reported in Table 2 for 1990 and Table 3 for 1991 for both first and second cuts.

Table 2: The Effect of Method of Establishment on First Production Year Yields of Alfalfa/Grass

Treatment	Yield(kg d.m./ha) Cut 1 - June 25	Yield(kg d.m./ha) Cut 2 - August 20	Yield Total (kg d.m./ha)
# 1 DSB	3985	2933	6918
# 2 DSD	3877	5844	9632
# 3 LBF	3495	3859	7354
# 4 HBF	3305	4145	7450
# 5 LBG	3486	2799	6285
# 6 HBG	1930	3199	5129

For the first production year, 1990, first cut yields were greatest for the direct seeded brillion treatment and lowest for underseeding to a high rate of barley harvested as grain. These results correspond directly to the measurements taken on the forage growth in the previous fall (1989). Generally, when examining the first cut yields, the direct seeded treatments yielded the highest, followed by the nurse crop treatment and finally the underseeded grain. The low rate of barley harvested as grain gave similar yields to the nurse crop treatments. Many of the

differences recorded in the first cut had disappeared by the second cut. There was very little rainfall in the July-August period and variability in soil drainage may have affected results.

In the second production year there were differences in yield between treatments in both first or second cuts. However, yields were less than half what would be expected under normal rainfall conditions. With yields reduced so severely due to a very dry June and July, it is not possible to attribute yield differences to establishment method alone.

What is most interesting however, is the percentage of alfalfa in each plot. The greatest percentage of alfalfa is in the direct seeded plot, while the least percentage of alfalfa is in the plot established with the high rate of barley harvested as grain. These results help confirm that direct seeding alfalfa using a brillion type seeder is often the best method of establishment.

Table 3
The Effect of Method & Establishment
on Production Year Yields of Alfalfa/Grass

	Treatment	Cut 1-June 22		Cut 2-Aug 9		
		Yield kg/ha	% alfalfa	Yield kg/ha	% Alfalfa	TOTAL YIELD
1	DSB	2936	58	703	97	3614
2	DSD	2364	52	1111	89	3019
3	LBF	2451	34	1009	71	3707
4	HBF	2675	51	1032	80	3460
5	LBG	2089	45	930	72	3475
6	HBG	2525	37	1089	63	3639

NO TILL PASTURE SEEDING

Peg Cummings, Crop Specialist
Leo Cox, Agriculture Representative, Inverness County

Abstract

Four pasture mixes were seeded with a Hunter No-Till Drill into an old sod pasture. Due to extreme drought conditions, germination was very slow. The annual ryegrass pasture mix established very quickly in comparison to the other mixes, followed by the perennial ryegrass mixture, orchardgrass mixture, with the timothy mixture appearing to be the poorest.

Four pasture mixes were seeded May 30, 1991, with a Hunter No-Till Drill into an old sod pasture. Plot size was approximately .40 ha each. The pasture had been unproductive and difficult to plow, due to its gravelly soil and no-till establishment was an option to renovate a much needed pasture back into production.

On May 16, a 2.5 L/ha roundup and 2.2 L/ha 2,4-D tank mix (in 150 L/ha water) was sprayed with a hardi sprayer. At the date of seeding 2 weeks later, the field was not completely browned due to the herbicide but continued to die off over the next few weeks. Broadleaf weed control was excellent at this time. Lime had been previously applied at 5 t/ha in early May and 250 kg/ha 12-24-24 was broadcast May 31, the day after seeding.

Due to extreme drought conditions, germination was very slow and by early July, germination was still not complete. Rain in mid July finally pushed pasture growth and by early August treatment plots were growing. Lack of grass competition, however, promoted a severe Canada thistle infestation. Clipping was the only measure of weed control available and though effective, did not eliminate the problem. Therefore, this is very much of a concern in pastures treated with roundup. However, seed establishment is almost nill without removal of top growth competition with roundup prior to planting.

The annual ryegrass pasture mix established very quickly in comparison to the other mixes, followed by the perennial ryegrass mixture, orchardgrass mixture, with the timothy mixture appearing to be the poorest. Yield data was not available for 1991.

As an alternative to plowing, no-till drilling can result in successful establishment of grass-legume mixtures. Weed control prior to seeding, with clipping and post-establishment control will be a necessity.

Soil Analysis

Organic Matter	6.3
pH	5.4
$P_2 0_5$	H+
$K_2 0$	H+

Co-operator: Tom and Donovan MacLennan, Mull River, Inverness County

Pasture Mixes

1)	Lemtal Annual Ryegrass	80%	35 kg/ha
	Alsike White Clover	20%	
2)	Farol Timothy	20%	20 kg/ha
	Mimer Meadow Fescue	65%	
	Sonya White Clover	15%	
3)	Gunne Perennial Ryegrass	40%	22 kg/ha
	Mimer Meadow Fescue	45%	
	Sonya White Clover	15%	
4)	Common Orchardgrass	30%	22 kg/ha
	Mimer Meadow Fescue	55%	
	Ladino White Clover	15%	

PERENNIAL PASTURE RENOVATION DEMONSTRATION

A. John Wilson, Soil and Crop Specialist

Abstract

In the fall of 1991, a pasture renovation project was started comparing native pasture, improved native pasture to improved pasture, using a no- till seeder. Yields, using square meter cages will be taken throughout the summer.

Pastures, one of the most economical ways to make milk or grow beef, but one often neglected to the point where they become run out.

The Annapolis County Soil and Crop Association has started to project this fall to look at pasture renovation. Two sites have been chosen. The Association will be looking at the following:

MATERIALS AND METHODS: Co-operators: Larry Hudson, Ed Hare.

Table 1

	No-Till	Improved Native Pasture	Native Pasture
Fall, 1991			
Round-up	Rate	-	-
Dyvel	-	Rate	-
Lime	4.5 t/ha	4.5 t/ha	-
Fertilizer	340 kg/ha 10-20-20	340 kg/ha 10-20-20	-
Spring, 1992			
Fertilizer	170 kg/ha 46-0-0	170 kg/ha 46-0-0	225 kg/ha 17-17-17
Seeded Spring	10% Sonja white clover	-	-
	40% Mimer meadow fescue	-	-
	50% Frode orchard grass	-	-
Nurse Crop	112 kg/ha barley	-	-
July, 1992			
Fertilizer	170 kg/ha 34-0-0	170 kg/ha 34-0-0	-

RESULTS AND DISCUSSION: Throughout the summer of 1992, yields will be taken with m^2 cages to determine which method produces the most economical return.

THE EFFECT OF THREE, SIX AND TWELVE METER SPACED TILE LINES ON THE YIELD AND PERSISTENCE OF ALFALFA ON SLOWLY PERMEABLE BASAL TILL SOIL (ALFI # TD 12)

Bill Thomas, Provincial Forage Specialist

A tile drainage project was set up in 1987 to examine the impact of 100mm pipe at 3, 6, or 12 meter spacings on both soil properties and crop performance on a shallow, slowly permeable soil. A multi-disciplinary team headed by Dr. Ali Madani, N.S.A.C. and consisting of members from Plant Industry Branch, Extension Engineering, and Agriculture Canada was formed to carry out the project.

A detailed soil survey was undertaken before the drainage was installed to establish a bench mark of the soil characteristics. Upon completion of the project a physical analysis will again be carried out to document the effect such field drainage has on soil physical properties over time. Tile outflow, water table height, soil moisture, and trafficability measurements have been monitored since 1988 and will be used to help evaluate the various spacings.

During the initial years of the project the effect of tile spacing on barley yields was assessed. In 1990, oats were underseeded to alfalfa/bromegrass. The current phase involves quantifying the effect the three tile spacings have on both yield and persistence of alfalfa/bromegrass. Data collection for this phase of the study began in 1991 and will continue through 1993 provided funding can be secured.

FORAGE SEEDING RATE TRIAL

Bill Thomas, Provincial Forage Specialist

The seeding ratios for species comprising the various forage mixtures recommended in Nova Scotia have never been assessed. The ratios currently recommended are based on seeding rates for pure stands and on past observations. A replicated trial was established in 1991 to determine the ratio of species that result from the following commonly recommended forage mixtures when seeded at the recommended ratios.

Forage Seeding Rate Trial

TRT #	Mixture	Mixture Component	Seeding Rate (kg/ha)
1	Common Triple Mix	Timothy	10.5
		Red Clover	2.25
		Alsike	2.25
2	Red Clover/Timothy Hay Mix	Timothy	8.4
		Red Clover	3.6
3	Haylage Mix	Timothy	5.85
		Meadow Fescue	1.56
		Red Clover	4.94
		Ladino Clover	.65
4	Timothy/Alfalfa Mix	Timothy	2.5
		Alfalfa	11.5
5	W. Clover Triple Mix	Timothy	10.5
		White Clover	1.0
		Red clover	3.5
6	Alfalfa/orchardgrass Mix	Alfalfa	9.75
		Orchardgrass	5.25
7	Alfalfa/Brome grass Mix	Alfalfa	11
		Brome Grass	9

The number of seeds sown and the viability of the seed for each species in the mix was determined prior to seeding. Seeding rates were adjusted for seed viability. The number of each specie that established was determined by plant counts in September '91. The dry matter contribution of each specie in the mixtures during the establishment year was determined through botanical separations. This study will trace the dynamics of the mixtures through plant counts and botanical separations for two years.

FALL SEEDING TRIAL FOR FORAGES

Bill Thomas, Provincial Forage Specialist

The preferred time for seeding forages is early spring. The cool moist weather in early spring is conducive to good establishment. Forages sown later than June 1 generally do not establish as well. The warm days of late spring easily dry the surface of the soil to a point were germination stops and young seedlings with undeveloped root systems can die.

Seeding from mid August to mid September when soil moisture conditions are good can give excellent results for particular forage species. Generally, some legumes can be established in the fall provided they are seeded before September, whereas certain grasses can be seeded as late as mid September. In order to increase our understanding as to which forage species can be fall established with good success and which are best seeded only in the spring a replicated trial containing all the following recommended grass and legume perennial forage species was seeded in Truro, September 15, 1991. The various species and mixtures will be rated in the spring for winter survival. Information generated from this trial will improve our recommendations on fall seeding of forages.

TRT	Mixture	Seeding Rate Kg/ha
1	Timothy (Toro)	8 kg/ha
2	Brome Grass (Common)	15 kg/ha
3	Orchardgrass (Frode)	10 kg/ha
4	Meadowfescue (Ensign)	12 kg/ha
5	Reedcanary Grass (Venture)	10 kg/ha
6	Perennial Ryegrass (Bastion)	15 kg/ha
7	Alfalfa(Iroquois) Timothy(Toro)	12 kg/ha 4 kg/ha
8	Red clover Timothy(Toro)	4 kg/ha 8 kg/ha
9	Ladino W. Clover (Sacramento) Orchardgrass(Frode)	3 kg/ha 8 kg/ha

LUNENBURG COUNTY PASTURE COMPETITION

A. John Wilson, Soil and Crop Specialist

Abstract

Eighteen participated in the annual and perennial pasture competition to promote good pasture management. The annual pasture competition was won by A. & G. Hebb, producing 9,221 kg/ha, 29% CP and 71% TDN with a mixture of Leger barley undersown to Felix Persian Clover and Maris Ledger ryegrass for a value of $1830/ha. The perennial competition was won by Peter Falkenham with a native pasture producing 10,726 kg/ha, 68% TDN and 21% CP for a value of $1946/ha.

INTRODUCTION: There are far too many pastures that are neglected to the point where they can only grow low yielding grass, bushes, and weeds. The participants in this competition have soil pH values of greater than 6.0 and carry out a good fertility program.

MATERIALS & METHODS Pasture management is up to the individual participant. Yields were taken using a square meter cage, cut at various stages during the summer (see harvest dates).

Winners were judged on total volume of pasture produced and not on total value. Dollar values were based on corn at $158/tonne and 48% soybean meal at $341/tonne, producing a $/kg protein = .467 and $/kg TDN = .147.

Harvest Dates:

Cut #1	May 28, 1991	Perennial
Cut #2	June 17, 1991	Annual and Perennial
Cut #3	June 27, 1991	Annual and Perennial
Cut #4	July 22-23, 1991	Annual and Perennial
Cut #5	August 19, 1991	Annual and Perennial
Cut #6	September 18, 1991	Annual and Perennial

RESULTS AND DISCUSSION: The following are the first four places in the Annual Pasture and Perennial Pasture Competition:

Annual Pasture Competition:

	Kg/ha	Mixture	% T.D.N.	% C.P.	$ Value
A. & G. Hebb	9221	Barley Felix/Maris Ledger	71	29	1830
B. & T. Mailman	7995	Maris Ledger/Felix	71	25	1581
Ons Erf Farm	6363	Barley Felix/Maris Ledger	73	19	1219
H. Eagle	6203	Maris Ledger	53	25	1080

Perennial Pasture Competition

	Kg/ha	% T.D.N.	% C.P.	$ Value
Falkenham	10,726	68	21	1946
L. Wile	8,046	70	21	1335
R. Veinot	7,828	66	20	1443
K. Crouse	7,784	72	21	1508

Drought was the major component affecting outcome. One perennial pasture in particular which was in 1st place after cut #1 dropped out of the top four placings because of the drought.

Drought also affected placing in the annual competition dropping one pasture from 1st to 3rd. Although sowing rates did not have an effect on placing, it did have an effect on yield.

It was found that planting Maris Ledger at a higher rate than 35 kg/ha adversely affected the barley planted with it. The extra competition for the barley lessened yield of the first grazing and weakened the root system, and combined with grazing the barley too late caused the barley to be pulled out taking the ryegrass along with it.

It is best to take the cover crop off as hay or haylage, but if it is to be grazed, it should be grazed at between growth stage 32 and 37. For hay or haylage, growth stage Zadok 45 is ideal (see Publication 100A).

ANNUAL PASTURE DEMONSTRATION

A. John Wilson, Soil and Crop Specialist

Abstract

Felix Persian Clover and Maris Ledger Annual Ryegrass mixed 6 kgs. Felix to 20 kgs. Maris Ledger planted at 30 kgs/ha was accepted readily by grazing Holstein.

INTRODUCTION: Felix Persian Clover has performed well at Charlottetown Research Station and in mixture with annual ryegrass on farms in Nova Scotia. The purpose of this demonstration is to introduce Persian Clover to the farming community.

MATERIALS AND METHODS:

Cultivar: Felix Persian Clover - 6 kg.
Maris Ledger - 20 kgs.

Planting Rate: 30 kg/ha

Planting Date: Early May

RESULTS AND DISCUSSION: Although no yields were taken, John reported good success this summer with this combination.

EVALUATION OF FORAGE PEA FOR SILAGE ALFI # TT 201

Bill Thomas, Provincial Forage Specialist

Abstract

Magnas forage pea sown with barley and Century grain pea sown with barley were compared for yield and protein content as a nurse crop at three farms. The Magnas forage pea/barley crop out yielded the Century pea/ barley crop at all three test sites. There was no difference in crude protein content between the two pea types.

INTRODUCTION: Using a cereal as a nurse crop when establishing a perennial forage is common practice in the Maritimes. The cereal crop reduces weed infestations while increasing yield. It is best to harvest the cereal/forage when the cereal head is just about to emerge from the leaf sheath; referred to as the boot stage. Harvesting the cereal at this early stage of development ensures maximum feeding value of the cereal. However, the protein content of cereal silage is quite low, commonly only 8 or 10 percent. In order to increase the protein content and thereby make the cereal silage a more complete feed some farmers have traditionally added an annual legume such as peas or vetch. In most recent years those few farmers adding annual legumes to their cereal nurse crops have favoured peas. To date the only peas available have been grain peas. Recently plant breeders have developed a pea with improved vegetative vigor, greater standability, and later seed development. Referred to as a forage pea, Magnas, is reported to have produced impressive results in Britain, increasing yields and protein content of cover crops.

Three farmers in Cumberland County were very interested in evaluating forage peas with barley for use as a nurse crop in establishing perennial forage mixtures. A.L.F.I. approved a project submitted by Mr David Firth, Shinimicas, on behalf of the three farms.

MATERIALS AND METHODS: To determine its relative performance, the forage pea, Magnas, was compared to Century, a seed type pea. Each farm grew at least a one hectare block of each pea type mixed with barley and underseeded to a perennial forage. The peas and barley were broadcast and harrowed in. The forage was planted using brillion seeders. Seeding rates were 50 kg/ha for Magnas and 70 kg/ha for Century. The peas were inoculated with the appropriate strain of rhizoctonia and the land was fertilized with 10-20-20 at 400 kg/ha.

Both peas were seeded in small observation plots with and without barley at Truro.

Yields were determined by harvesting five one square meter samples from each treatment at each farm site when the barley was at the boot stage of development. The haldrup small plot harvester was used to determine yields at the Truro test plots. Botanical separations were performed on material harvested at Truro to determine the dry matter composition of the mixture at harvest.

RESULTS AND DISCUSSION: The Magnas forage pea/barley crop performed better at all three farm sites and at the observational plots in Truro, giving higher yields than the Century/barley mix. The peas made up 10% of the harvested material in both the Century/barley and the Magnas/barley plots when separated at Truro. The addition of peas, both Magnas and Century, to the barley improved the feeding value of the silage. Both the Magnas and Century silage mixtures had protein contents in excess of 18%.

Barley/Pea Nurse Crop Yields
Kg/ha Dry Matter

	Barley/Century Pea	Barley/Magnas Forage Pea
Farm 1	3234	4336
Farm 2	N/A	N/A
Farm 3	3099	3498
Truro Test Plots	2484	2647

PRODUCTION MANAGEMENT TRIALS

Dwane Mellish, P.Ag, Assistant Director, Field Crops

Abstract

As an ongoing series of production management trials, winter wheat, spring wheat, 6 and 2 row barley were seeded as individual trials and managed under four management levels. There are several trial locations throughout the Maritime Region.
By evaluating the response of varieties to the four management levels, recommendations for registration of varieties and for cropping under a specific management regime on growing conditions can be improved.

INTRODUCTION: Individual varieties respond to inputs in different ways and to various degrees, according to their inherited genetic potential. With the increased emphasis on the need to fine tune on-farm management practices, the response of available varieties to different management levels is important in deciding what variety to plant according to the management regime.

The production management trials are an ongoing series of trials at several locations in the Maritimes (Truro, Nappan, and Canning, Nova Scotia; New Brunswick and 3 locations in Prince Edward Island) to study the response of promising varieties to 4 management levels.

The management levels are a progression from a relatively low management input, to a higher level of input. In general terms, (as each species require adjustments to management regimes) the treatment levels are T1 – Conventional, T2 – Additional Nitrogen, T3 – T2 plus disease control, and T4 – T3 plus lodging control. Details of each management regime is recorded in the following individual species reports. The response of each individual variety to each treatment, as well as combined varietal response to treatments are studied.

The varieties are chosen as promising varieties from regional screening and variety trials, as well as promising varieties from other areas such as England, Germany, and Western Canada. (Table 1 & 2)

CONCLUSION: The production management trials are an important component of the evaluation and recommendation of varieties for registration and also the recommendation of varieties for different management regimes. The following summaries highlight the results of these trials.

ACKNOWLEDGEMENTS: Partial funding for the production management trials is provided by the Canada/Nova Scotia Livestock Feed Initiative.

BARLEY PRODUCTION MANAGEMENT TRIALS

Dwane R. Mellish, P.Ag., Assistant Director, Field Crops
Charles R. Surette, Agricultural Technician

Abstract

Ten varieties/lines of 2-row and 6-row barley were evaluated at Great Village, Nova Scotia under four management levels. The abnormally hot, dry growing season greatly reduced the yield potential of the barley. The 2- row had no significant increase in yield due to additional management inputs. The 6-rows increase yields with management levels but not enough to provide economic benefits. In past years, economic benefits were achieved with selected additional inputs.

INTRODUCTION: The 2-row barley evaluated were; AB128-5, AB143-3, Albany, FRJN502, Lester, Morrison, QB243-13, QB243-83, Symko, and Winthrop. Albany and Morrison are on the Atlantic Provinces recommended list and were used as the standards for comparison.

The 6-row barley evaluated were: AB99-13, BT490, Chapais, Duke, Leger, AC Burman (OB907-33), QB956-13, QB232-7, Robust, and Sabina. Leger has full recommendations for the Atlantic Provinces, while Chapais and Duke have provisional recommendation in the Atlantic Provinces. These three were used as the standards for comparison.

MATERIALS AND METHODS: The production management trial of 2 and 6 row barley were seeded April 26th as a split plot. Main plots were 4 management levels with subplot varieties. Seeding rate was 400 viable seeds/m^2, plot size 1.25m x 6m with 8 rows 15 cm apart.

Refine (2.0 g/ha + 2% Agral 90) applied at ZGS 23 for weed control.

The management levels are listed below:

Management Levels:

T1)	Standard	-	No additional treatments
T2)	Additional N	-	Management I plus 150 kg/ha 34-0-0
T3)	Additional N + Fungicide	-	Management II plus Tilt 125 gai/ha @ ZGS 39
T4)	Additional N + Fungicide + P.G.R.	-	Management III plus Cerone 300 gai/ha @ ZGS 39/40

Harvest was done with a Hege 125b combine August 7th.

RESULTS AND DISCUSSION: The weather conditions had a severe limiting effect on the trial. The spring was cold and damp, while most of the rest of the growing season was hot and very dry. These conditions resulted in an observable reduction in yield potential of the varieties. Tillering, plant height, and grain filling was affected adversely. There was very low disease pressure and no lodging.

6-Row Barley

Yields were significantly affected by treatments T3 (4.8 t/ha), T2 (4.8 t/ha), and T4 (4.7 t/ha) were significantly higher than T1 (4.5 t/ha). Varietal differences were also significant. Robust (5.1 t/ha), Chapais (5.0 t/ha), and AB99-13 (4.9 t/ha) yielded highest. Leger yielded least (4.1 t/ha). Individual variety response to each treatment can be seen in the included tables.

Test weights and plant heights produced significant treatment, varietal and treatment by variety differences. The significant interaction indicates varieties responded differently to the treatments. The highest test weight 65 kg/hl was AC Burman (OB907-33) (T2), Robust (T2 and T4), and Sabina (T4). Compared to the other treatments, the plant growth regulator treatment (T4), reduced plant heights.

2-Row Barley

No significant treatment affects were produced for any measured parameter (plant heights, yield, or test weights). The highest significant yielding varieties were FRJN502 (4.7 t/ha) and AB143-3 (4.5 t/ha). Morrison had the highest test weight (70 kg/hl) with Symko (69 kg/hl) and FRJN502 (68 kg/hl) ranked next. QB243-13 (73.3 cm) was the tallest, while FRJN502 (58.9 cm) was the shortest variety.

Cost of Production

Cost of production figures were used to calculate the cost/tonne of grain produced under the four management systems. Variable costs were calculated to be $393.68/ha, including costs for production, harvesting, and cost overhead, based on Farm Management Factsheet 1988-104. It is assumed barley was grown on a farm with more than the barley enterprise sharing the fixed cost. A fixed cost of $130.62 is used. A straw credit of $50/ha is deducted from the total cost. The base cost of production is ($393.68 + $130.62 - $50) $474.30.

The costs of additional input were; nitrogen ($.81/kg of N), Tilt ($14.88 /ha), and Cerone ($37.19/ha). Application cost for fungicide was $6.40/ ha and fertilizer was $6.90/ha.

With no significant increase in yields by treatments for the 2-rows, the application of additional inputs was not as cost effective as can be seen by the cost of production table. The significant increase of yield for the 6-row was not enough to affect the cost of additional input as the cost table shows.

From field observations of the trial, it was obvious that before the application of the fungicide (T3) and PGR (T4), the yield potential of the barley was severely limited by the stressed weather conditions (hot and very dry through the growing season). These weather conditions severely reduced tillering and stunted plant growth. The use of the additional inputs under these weather conditions would probably not be recommended at the farmer level for this particular years situation. In the past years, economic benefits were achieved, due to sufficient yield increases using additional inputs.

CONCLUSION: Under weather conditions similar to this year (hot and very dry), the agronomic and therefore economic benefits of additional inputs can be limited. Therefore, if it is obvious that serious yield potential reduction is present (i.e. low tillers, stunted growth, etc.), the use of additional inputs may be questionable. In past years, in more normal growing conditions, definite economic advantages were produced by the increased yields due to additional inputs.

2-Row Barley - Grain Yield (t/ha)

	T1	T2	T3	T4
Variety	Standard	Standard + Additional N	Additional N + Fungicide	Add N + Fung. + P.G.R.
AB128-5	4.0	4.3	4.1	3.8
AB143-3	4.5	4.8	4.3	4.4
Albany	4.3	4.3	4.0	4.0
FRJN502	5.0	4.8	4.6	4.5
Lester	4.0	4.5	4.3	4.6
Morrison	4.3	4.4	4.3	4.0
QB243-13	4.4	4.3	4.2	4.0
QB243-83	4.1	4.2	4.2	4.2
Symko	3.8	4.0	3.7	3.7
Winthrop	4.4	4.2	4.0	4.1

6-Row Barley - Grain Yield (t/ha)

Variety	Standard	Standard + Additional N	Additional N + Fungicide	Add N + Fung. + P.G.R.
AB99-13	4.7	5.0	4.9	5.1
BT490	4.6	4.7	4.7	4.8
Chapais	4.7	4.8	5.1	5.2
Duke	4.7	5.0	4.8	5.1
Leger	3.9	4.2	4.4	4.0
AC Burman	4.6	4.9	5.0	5.0
OB956-13	4.5	5.0	4.5	4.6
QB232-7	4.4	4.8	4.9	4.6
Robust	4.8	5.2	5.3	5.1
Sabina	4.2	4.3	4.7	4.2

2-Row Barley Cost of Production ($/tonne)

Variety	Standard ($474.30/ha)		Add N ($521.70/ha)		Add N + F ($542.98/ha)		Add N + F + PGR ($586.57/ha)	
AB128-5	4.0	118	4.3	121	4.1	132	3.8	154
AB143-3	4.5	105	4.8	109	4.3	126	4.4	133
Albany	4.3	110	4.3	121	4.0	136	4.0	147
FRJN502	5.0	95	4.8	109	4.6	118	4.5	130
Lester	4.0	119	4.5	116	4.3	126	4.6	128
Morrison	4.3	110	4.4	116	4.3	126	4.0	147
QB243-13	4.4	108	4.3	121	4.2	129	4.0	147
QB243-83	4.1	116	4.2	124	4.2	129	4.2	140
Symko	3.8	125	4.0	130	3.7	147	3.7	159
Winthrop	4.4	108	4.2	124	4.0	136	4.1	143

6-Row Barley Cost of Production ($/tonne)

Variety	Standard ($474.30/ha)		Add N ($521.70/ha)		Add N + F ($542.98/ha)		Add N + F + PGR ($586.57/ha)	
AB99-13	4.7	101	5.0	104	4.9	111	5.1	115
BT490	4.6	103	4.7	111	4.7	116	4.8	122
Chapais	4.7	101	4.8	109	5.1	106	5.2	113
Duke	4.7	101	5.0	104	4.8	113	5.1	115
Leger	3.9	122	4.2	124	4.4	123	4.0	147
AC Burman	4.6	103	4.9	106	5.0	109	5.0	117
OB956-13	4.5	105	5.0	104	4.5	121	4.6	128
QB232.7	4.4	108	4.8	109	4.9	111	4.6	128
Robust	4.8	99	5.2	100	5.3	102	5.1	115
Sabina	4.2	113	4.3	121	4.7	116	4.2	140

WINTER WHEAT PRODUCTION MANAGEMENT

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Abstract

Ten varieties of winter wheat under four management levels were evaluated at Truro, Nova Scotia. MV15 produced the highest overall yield (8.1 t/ha) under T3 (additional N + fungicide). Fundelea yielded the highest under T4 (additional N + fungicide + PGR) 7.6 t/ha and was equal to MV15 under T2 (additional N) 7.3 t/ha. Ruby (6.2 t/ha) yielded highest under standard management and was consistently close to the best yielding varieties under the other three managements. Variety by management interactions for yield and thousand kernel weights indicates some varieties reacted differently to the management levels.

INTRODUCTION: Ten winter wheat varieties were evaluated. Absolvent, Borden, Fundelea, Karat, Kastor, M85W7, MV15, Ruby, TW87-317, and 1959-W-12. Absolvent and Borden were used as the standard varieties for comparison. Absolvent and Borden are on the recommended list for the Atlantic Provinces, while Fundelea and Karat have a provisional recommendation for the Atlantic Provinces. A request has been made for registration of M85W7 with the proposed name of Bolero.

MATERIALS AND METHODS: The winter wheat varieties; Absolvent, Borden, Fundelea, Karat, Kastor, M85W7, MV15, Ruby, TW87-317, and 1959-W-12 were seeded (Sept. 14, 1990) as a split plot design, with management as the main plot and varieties as subplots. There were four reps in the trial. The seeding rate was 400 viable seeds/m^2. Plot size was 1.25m by 6m with 8 rows, 15 cm apart. The trial was located at Brookside, N.S. on N.S. Dept. of Agriculture and Marketing land, on a sandy loam soil.

Fertilization at seeding was 400 kg/ha of 5-20-20 Refine (20 g/ha) plus Agral 90 (2L/100 l) was applied for weed control (specifically corn spurry and cadlock) at ZGS 31.

The four management levels are listed below:

T1)	Standard	-	150 N kg/ha 34-0-0 @ ZGS 22 150 N kg/ha 34-0-0 @ ZGS 30
T2)	Additional N	-	75 N kg/ha 34-0-0 @ ZGS 22 75 N kg/ha 34-0-0 @ ZGS 30 50 N kg/ha 34-0-0 @ ZGS 45
T3)	Additional N + Fungicide	-	Treatment 2 plus 125 gai/ha Bayleton @ ZGS 30/31 125 gai/ha Tilt @ ZGS 45 and 60 1000 gai/ha Dithane @ ZGS 45 and 60
T4)	Additional N + Fungicide + P.G.R.	-	1.5 L Cycocel Extra @ ZGS 30

The plots were combined August 8 with a Hege 125b plot combine.

RESULTS AND DISCUSSION: The winter conditions were severe for winter survival. The spring was cold and damp with a very dry summer. Disease pressure was low and only limited lodging occurred in Borden.

There were no significant differences for winter survival due to the management levels. Winter survival differences did occur among the ten varieties with Fundelea (95%), Ruby (94%), MV15 (93%), and Borden (92%) being significantly higher than the other varieties. TW87-317 (80%) and 1959-W-12 (79%) were ranked next with Kastor (65%), Absolvent (60%), Karat (56%), and M85W7 (56%) having significantly lower winter survival ratings.

Yields for management levels and varietal differences were significant, as well as a varietal by management interaction. This interaction indicates that some varieties reacted differently to the management levels.

With the exception of Borden, all yields were increased with the addition of N management (T2) level. Fundelea increased the most from 5.7 t/ha to 7.3 t/ha. The addition of fungicide (T3) reduced yields for Absolvent, Fundelea, Karat, Kastor, M85W7, and 1959-W-12 and increased the yields of Borden, MV15, Ruby, and TW87-317. The addition of a plant growth regulator (T4) increased yields for Absolvent, Fundelea, Karat, Kastor, M85W7, and 1959-W-12. Yields for TW87-317 remained the same with yields for Borden, MV15, and Ruby being reduced by the PGR application. The consistently highest yielding varieties over the 4 management levels were Fundelea, MV15, and Ruby. MV15 produced the highest overall yield under T3 (8.1 t/ha).

No significant differences in test weight were produced due to the management levels. Test weight differences for varieties and management by variety interactions were significant. Fundelea and Ruby had consistently the highest test weight over the 4 management levels.

Significant differences in thousand kernel weights occurred with management, variety, and management by variety interaction. M85W7 had the highest TKW in the standard management (41.8 g/1000 seed), additional N (42.8 g/1000 seed), and the addition of P.G.R. (44.0 g/1000 seed). The highest overall TKW was 1959-W-12 (44.5 g/1000 seed) with the addition of a fungicide (T3).

CONCLUSION: Significant management by variety interaction for yields and thousand kernel weights indicates the response of each variety to management was different. The overall highest yield was MV15 (8.1 t/ha) under T3 (additional N + fungicide). Fundelea yielded the highest (7.6 t/ ha) under T4 (additional N + fungicide + P.G.R.) and was equal to MV15 (7.3 t/ha) at the T2 level (additional N). Ruby yielded highest under the standard management level (T1) and was consistently close to Fundelea and MV15 under the other management levels.

Winter Wheat Production Management Trial 1991
Yield (t/ha)
Management Levels

Variety	Standard	Add N	Add N + F	Add N + F + P.G.R.
Absolvent	3.1	4.0	3.6	4.1
Borden	5.5	5.1	6.6	6.4
Fundelea	5.7	7.3	7.0	7.6
Karat	4.1	4.8	4.3	5.0
Kastor	4.2	5.4	4.6	6.0
M85W7	4.4	5.5	4.2	5.5
MV15	6.1	7.3	8.1	7.5
Ruby	6.2	6.6	7.7	7.5
TW87-317	5.9	6.1	6.6	6.6
1959-W-12	4.5	5.3	4.8	5.4

Winter Wheat Production Management Trial 1991
1000 K.Wt. (gms/1000)

Variety	I	II	III	IV
Absolvent	36.8	39.5	40.5	41.0
Borden	36.8	35.0	39.3	39.3
Fundelea	36.0	38.0	37.3	36.8
Karat	39.3	39.0	40.0	40.8
Kastor	38.3	39.0	40.8	40.5
M85W7	41.8	43.8	43.0	44.0
MV15	35.0	35.3	36.3	34.5
Ruby	36.3	36.0	38.5	37.3
TW87-317	36.3	39.5	37.0	36.0
1959-W-12	39.3	41.5	44.5	40.3

Winter Wheat Production Management Trial 1991
Test Weight (kg/hl)

Variety	I	II	III	IV
Absolvent	75.5	77.9	76.2	76.7
Borden	74.5	73.8	75.5	75.6
Fundelea	78.1	79.8	79.7	79.6
Karat	77.1	79.0	74.3	75.9
Kastor	76.9	79.7	77	77.5
M85W7	76.0	77.8	74.4	76.6
MV15	75.3	77.1	77.6	77.2
Ruby	78.1	79.4	79.9	79.3
TW87-317	71.5	73.4	73.6	73.7
1959-W-12	76.6	77.5	76.3	76.9

SPRING WHEAT PRODUCTION MANAGEMENT

Dwane R. Mellish, P.Ag., Assistant Director, Field Crops
Charles Surette, Agricultural Technician

Abstract

Eight spring wheat varieties were evaluated under four management levels at Great Village, Nova Scotia. The cold damp spring and hot, very dry growing season resulted in reduced tillering, short straw, and reduced grain filling. This resulted in an observable reduction in grain yield potential. These factors along with very low disease pressure and lodging, resulted in no economic or agronomic benefit of additional inputs (disease or lodging control).
Belvedere, Baltic, Hege 770-87, LP6021-3-86, Algot, and FRH17-77-2 yielded significantly higher than Katepwa and Max.

INTRODUCTION: The eight spring wheat varieties seeded were: Algot, Baltic, Belvedere, FRH17-77-2, Hege 770-87, Katepwa, LP6021-3-86, and Max. Max and Katepwa are both of milling quality and along with Belvedere were used as the standard for comparison. Max and Belvedere are on the recommended list for the Atlantic Provinces, while Katepwa is only recommended for New Brunswick and Prince Edward Island. A registration has been requested for FRH17-77-2 (Heather).

MATERIALS AND METHODS: The spring wheat varieties; Algot, Baltic, Belvedere, FRH17-77-2, Hege 770-87, Katepwa, LP6021-3-86, and Max were seeded April 27 as a split plot design, with management (treatment) as the main plot and varieties as the subplot. The seeding rate was 400 viable seeds/m^2, plot size 1.25m x 6m with 8 rows 15 cms apart. The trial was in Great Village, Nova Scotia on Bob Cooper's farm.

Refine (20 g/ha + -2% Agro 90) was applied ZGS 23 for weed control.

The four management levels are listed below:

T1) Standard - 400 kg/ha 17-17-17 seeding

T2) Additional N - 400 kg/ha 17-17-17 seeding
ZGS 30 150 kg/ha (50 kg/ha N 34-0-0)
ZGS 45 150 kg/ha (50 kg/ha N 34-0-0)

T3) Additional N + Fungicide - Fertilizer same as T2 plus
ZGS 39/45 Tilt 125 gai/ha
ZGS 55 Dithane 1 kg/ha

T4) Additional N + Fungicide + P.G.R. - Nitrogen & Fungicide as in T3 plus
ZGS 39/45 Cerone 280 gai/ha

Harvest was done with a Hege 125b small plot combine on August 26.

RESULTS AND DISCUSSION: For several weeks after seeding, the weather was cold and damp. The rest of the growth season to harvest was hot and very dry. Weather conditions severely stressed the plant growth and limited yield potential. Plant heights, tillering, and

grain filling were reduced and therefore yield components. There was also very low disease pressure and no lodging.

No significant treatment effect on yield occurred. Significant varietal differences were produced. Belvedere (3.3 t/ha), Baltic (3.3 t/ha), Hege 770-87 (3.3 t/ha), LP6021-3-86 (3.3 t/ha), Algot (3.2 t/ha), and FRH 17-77- 2 (3.2 t/ha) gave the highest grain yield. Katepwa (2.9 t/ha) was next and Max (2.7 t/ha) produced the lowest significant yield.

Test weight produced no significant differences for treatment or variety. Trial mean test weight was 75 kg/hl. Plant heights were significantly affected by treatment, variety, and there was a treatment by variety interaction.

Field observation of plant growth in the trial and the resulting yield potential reduction was noted before the application of additional inputs (fungicide and P.G.R.). Normally a crop under such stressed weather conditions, the usefulness of additional inputs (both economic and yield potential increase) would be questioned. However, to maintain trial continuity, and to assess the effect of these inputs on the varieties, the inputs were applied.

CONCLUSION: The weather conditions produced an observable severe reduction in the yield potential before the application of additional inputs (fungicide and P.G.R.). The economic and agronomic benefits of these inputs were very limited and therefore under these particular growing conditions a producer would unlikely need their application.

RESPONSE OF VARIETIES TO MANAGEMENT
Yield (t/ha)
Management Levels

Variety	Standard	Add N	Add N + F	Add N + F + P.G.R.
Algot	3.1	3.2	3.3	3.2
Baltic	2.8	3.5	3.4	3.6
Belvedere	2.6	3.3	3.6	3.8
FRH17-77-2	3.1	3.2	3.6	2.7
Hege 770-87	2.9	3.5	3.5	3.3
Katepwa	2.7	3.0	3.1	3.0
LP6021-3-86	3.0	3.6	3.4	3.2
Max	2.4	2.7	3.0	2.7

OAT VARIETY EVALUATION TRIAL

Dwane R. Mellish, P.Ag., Assistant Director, Field Crops
Charles R. Surette, Agricultural Technician

Abstract

Twelve oat varieties were evaluated in Colchester and Kings County, Nova Scotia, as part of a Maritime series of trials. Donegal (TO85025) and Capital yielded best in Kings County, while Capital, Nova, AC Stewart, Shaw, and Donegal (TO85025) yielded highest in Colchester County.

INTRODUCTION: As part of a series of oat variety evaluation trials throughout the Maritimes, two locations in Nova Scotia were seeded; Great Village, Colchester County and Woodside, Kings County. Varieties evaluated were Capital, Marion, AC Lotta (NO 820-3), AC Percy (NO 825-1), AC Hill (NO 826-3), Nova, AC Stewart (OA796-15), Sentinel, Shaw, Tibor, TO85025, and Ultima. Fully recommended varieties in the Atlantic Provinces are Capital, Marion, Nova, and Tibor. Ultima has provisional recommendation. Hulless varieties are Tibor, AC Lotta (NO 820-3), AC Percy (NO 825-1), and AC Hill (NO 826-3).

MATERIALS AND METHODS: The Great Village, N.S. trial was established on April 26 at the farm of Mr. B. Cooper and the Woodside, N.S. trial on May 14 at the research site of Agriculture Canada. The Woodside site was seeded later than normal. Harvesting was done with a Hege 125b plot combine (Great Village August 26, Woodside August 27). Seed rate was 400 viable seeds/m^2 with 15 cm row spacing. Plot size was 1.25m X 6m. Plot design was a randomized complete design with 4 replicates. Weed control at the Great Village site was Refine (2.0 gm/ha and Agral 90 @ 2%) at ZGS 23. No chemical control was applied at the Woodside site due to close proximity of soybean trials and was weeded by hand.

RESULTS AND DISCUSSION: The growing season was hot and very dry, which limited the yield potential of the oats, especially the Great Village site. The trial site at Woodside was located at a normally moist section of the field, which probably helped the performance of this trial.

There was little disease pressure at either location. Lodging at the Woodside site was very limited, while lodging at the Great Village site was severe over the whole trial due to rain and wind just prior to the late August harvest.

Great Village Site

Capital (3.8 t/ha), Nova (3.7 t/ha), AC Stewart (OA796-15) (3.6 t/ha), Shaw (3.5 t/ha), and Donegal (TO85025) (3.3 t/ha) produced the highest yields. The highest test weight was produced by AC Percy (58 kg/hl). The tallest varieties were AC Percy (105 cm) and AC Hill (101 cm).

Woodside Site

Donegal (TO85025) (4.9 t/ha) and Capital (4.2 t/ha) produced the highest yields. The highest test weights were produced by Tibor (49 kg/hl) and AC Hill (49 kg/hl).

CONCLUSION: The hot, very dry weather reduced the yield potential of the oats, especially at Great Village. At the Woodside site, Donegal (TO85025) and Capital yielded best, while at Great Village; Capital, Nova, AC Stewart (OA796-15), Shaw, and Donegal (TO85025) were the best yielding varieties. The highest yielding hulless varieties were AC Hill and AC Percy.

OAT VARIETY TRIAL

Woodside, N.S.

Variety	Yield (t/ha)	Test Wt. (kg/hl)
Capital	4.2 ab	42 c
Marion	3.2 cde	44 bc
AC Lotta (NO820-3)^{H}	1.9 f	46 abc
AC Percy (NO825-1)^{H}	3.1 de	49 ab
AC Hill (NO826-3)^{H}	2.5 ef	49 a
Nova	3.1 cde	44 bc
AC Stewart (OA796-15)	4.0 bc	44 abc
Sentinel	3.5 bcd	42 c
Shaw	3.7 bcd	41 c
Tibor^{H}	2.5 ef	49 a
Donegal (TO85025)	4.9 a	43 bc
Ultima	4.0 bc	43 c
LSD (.5)	.8	5

H = Hulless Variety

Great Village, N.S.

Variety	Yield (t/ha)	Test wt. (kg/hl)	Plant Ht. (cm)
Capital	3.8 a	47 ef	87 def
Marion	2.8 c	47 e	96 bc
AC Lotta (NO820-3)^{H}	1.7 d	55 b	93 cd
AC Percy (NO825-1)^{H}	2.5 c	58 a	105 a
AC Hill (NO826-3)^{H}	2.5 c	55 b	101 ab
Nova	3.7 a	50 c	89 cde
AC Stewart (OA796-15)	3.6 a	45 h	80 f
Sentinel	2.8 bc	49 d	89 cde
Shaw	3.5 a	46 fgh	89 cde
Tibor^{H}	1.8 d	54 b	96 bc
Donegal (TO85025)	3.3 a	45 gh	90 cde
Ultima	2.4 c	46 efg	82 ef
LSD	.5	1.0	7

H = Hulless Variety

SPRING CEREAL SEEDING RATE AND ROW SPACING

Dwane Mellish, P.Ag., Assistant Director, Field Crops
Charles Surette, Agricultural Technician

Abstract

A three year study was conducted evaluating the response of 2 and 6 row barley and spring wheat to varying row spacing (8 and 16 cm) and seeding rate (150, 300, 450 and 600 seeds/m^2). All three years had drier than normal grain filling periods. Narrow row spacing generally increased both plant and head populations.
Adequate narrow row spacing increased grain yields. Optimum rates of seeding depended upon the crop kind, but generally moderate seeding rates (300-400 seeds/m^2) gave the best yields.

INTRODUCTION: With new varieties and management practices, the optimum seeding rate and row spacing are a component in achieving maximum yield. Not only is the cost of seed a factor in seed rate but also how does seed rate and row spacing affect the growth of a crop, and therefore its yield potential. An increase in plant population in the same area due to an increased seed rate and row spacing can affect plant competition (sun/radiation/nutrients/moisture) tillering, and disease levels.

These trials have been developed to evaluate the effects on yield of seed rate and row spacing at the farm scale level.

The seeder used is a 3m Amazon seeder, capable of varying seed rate and row spacing. The trials are incorporated into the farmer's own field of grain, so that his management protocol and equipment could be used.

MATERIALS AND METHODS: The trials were seeded in early May each year, on the land of the co-operator, Mr. Bob Cooper, Great Village, Col. Co., N.S.. The blocks of trials were established between the tramlines in actual grain fields, so that they could be incorporated into the management protocol of the whole field. All management inputs were applied by the farmer, using his own field equipment with the trials being, where possible, a continuation of the particular field crop. Recommended varieties of the crop kinds involved were seeded

The field seeder used was an Amazon, owned by Mr. Cooper and partially funded by the Canada/N.S. Livestock Feed Agreement. This is a 3 meter seeder with the capability to adjust seeding rate and row spacing. At the appropriate mark in the field, the seeder was stopped and the predetermined settings were changed to vary the seed rate and row spacing. A 5 meter buffer was included to allow the seed flow to adjust to each new setting. Due to the limitations of the seeder, the higher seed rates at the 16 cm row spacing was not achieved.

The plots were 3m x 10m. The seed rates were 150, 300, 450, and 600 with row spacing of 8 and 16 cm. Trial design was RCBD. Observations and harvest were done by the Plant Industry Branch staff. A Hege 125b plot combine was used to harvest a 1.25 x 10m section in the centre of the 3m plot.

RESULTS AND DISCUSSION: In 1991, the growing season being very dry, reduced disease pressure and also yield potential. Severe lodging occurred in the barley in all treatments due to heavy rain and wind just prior to harvest but this was so late in the season, it did not significantly effect final yields.

Grain yields were generally lower than normal. Row spacing had a significant effect on only the yield of Chapais barley (Table #1), where a slight advantage was attributable to the 16 cm row spacing (Table #2). Seeding rate did not effect grain yield. Seeding rate and test wt. were effected in most cases by both row spacing and rate of seeding.

In extremely dry growing conditions, it is not unexpected that the wide row spacing and a lower seeding rate would produce as much of a grain yield as the narrow row spacing. Wide row spacing and lower seeding rates are the norm in areas which normally have a much lower annual rainfall.

The 1990 growing season clearly demonstrated that narrow row spacing and increased seeding rates can increase both plant and head populations. Due to a very dry grain filling period, higher populations did not express themselves in higher grain yields.

In 1989, under reasonable growing conditions, there was a consistent yield advantage in all three crop kinds, when grown in 8 cm vs. 16 cm row spacing. There was significant effects of seeding rates on yield components (heads/m^2, kernels/head, and kernel wt) but there was only a minimal affect on final grain yield.

CONCLUSION: Responses in both yield components and final yield varied among years, indicating that growing conditions have a strong influence on final grain yields. It also indicates that yield components interact and can be manipulated by adjusting row spacing and seeding rate.

Narrow row spacing generally increased both plant and head populations. Adequate narrow row spacing increased grain yields. Optimum rates of seeding depended upon the crop kind but generally moderate seeding rates (300-400 seeds/m^2) gave the best yields.

ACKNOWLEDGEMENT: Financial support provided by the N.S. Dept. of Agriculture and Marketing research fund is greatly acknowledged.

Table #1

Seeding Rate & Row Spacing (1991)
ANOVA Tables

	2-Row Barley (Rodeo)		6-Row Barley (Chapais)		Spring Wheat (Belvedere)	
	Yield	Test Wt.	Yield	Test Wt.	Yield	Test Wt.
Rate	N.S.	**	N.S.	**	N.S.	**
Space	N.S.	**	*	**	N.S.	N.S.
Rate x Space	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Table #2

Seeding Rate & Row Spacing (1991)

Spacing (cm)	Rate (seeds/m^2)	2-Row Barley Yield (t/ha)	2-Row Barley Test. Wt. (kg/hl)	6-Row Barley Yield (t/ha)	6-Row Barley Test. Wt. (kg/hl)	Spring Wheat Yield (t/ha)	Spring Wheat Test. Wt. (kg/hl)
8	150	3.4	65	4.2	61	3.4	74
8	300	3.6	63	4.2	58	3.6	73
8	450	3.7	62	3.7	57	3.0	73
8	600	3.6	62	3.9	56	3.2	72
16	150	4.0	65	4.4	61	3.7	74
16	300	3.8	64	4.3	59	3.6	73
16	450	3.5	64	4.3	59	3.5	73
16	600	3.7	63	4.1	60	3.1	72

Table # 3

Seeding Rate & Row Spacing (1990)

Spacing (cm)	Rate (Seeds/m^2)	2-Row Barley Plants/m^2	2-Row Barley Heads/m^2	6-Row Barley Plants/m^2	6-Row Barley Heads/m^2	Spring Wheat Plants/m^2	Spring Wheat Heads/m^2
8	150	246	816	255	492	216	672
8	300	468	864	429	528	348	750
8	450	594	966	465	549	432	684
8	600	679	1071	627	816	600	951
16	150	207	613	165	273	141	372
16	300	349	577	267	325	277	421
16	450	-	-	344	410	348	452
16	600	-	-	-	-	-	-

ON FARM WINTER WHEAT TRIALS

Dwane R. Mellish, P.Ag., Assistant Director, Field Crops
Charles Surette, Agricultural Technician

Abstract

Winter wheat varieties were evaluated at Woodville, Kings County and Nappan, Cumberland County under a trial design which is close to field conditions. Valuable information was gathered on current and promising varieties. Both locations identified several varieties which yielded well, i.e. Borden (6.6 t/ha) the highest of the group at Nappan and Fundelea (5.5 t/ha) at Woodville.

INTRODUCTION: Most variety evaluation is conducted in relatively small plots and is managed by small plot equipment. There is some thought that the evaluation of varieties within a field of wheat with treatments applied by field scale equipment might give a better evaluation of the potential performance of varieties. This approach is used in some European Countries.

The results of a similar 1990 trial were very useful, therefore this trial design was continued for 1991 and expanded to include barley.

The locations were established in Woodville, Kings County and Nappan, Cumberland County. The varieties evaluated at Woodville were Absolvent, Borden, Century, CWW8712, Fundelea, Fresco, Gawain, Karat, Kastor, M85W7, MV15, Trillium (winter triticale), Ruby, CH8, and Zombra. The Nappan location included all the above with the exception of Kastor.

Absolvent and Borden are fully recommended in the Atlantic Provinces, while Fundelea and Karat have provisional recommendation in the Atlantic Provinces.

MATERIALS AND METHODS: The trials were established on the farms of the co-operators; Mr. P. Clarke, Woodville, N.S. on Sept. 12 and Mr. P. Pederson, Nappan, N.S. on Sept. 10. Plot size was 1.25 x 10m with 15 cm row space and seeding rate of 400 viable seeds/m^2. Plot design was a randomized complete block with 4 replicates.

The trial was established in a field of winter wheat between the tramlines. In this way, the trial received the same management as the field of wheat with application of inputs being done with the field equipment of the co-operator at the time of field application. All varieties/lines included in the test were either registered or showed good potential in early generation testing.

The trial sites received adequate fertility, fungicide disease control, and growth regulator to meet the needs of the field crop as deemed necessary by the co-operator.

Combining was done with a Hege 125b plot combine August 14 (Nappan) and July 30 (Woodville). Harvesting was done after the co-operator had combined his crop.

RESULTS AND DISCUSSION: The winter was severe, however survival for most varieties was good. Early spring was cold and damp with the rest of the growing season being hot and very dry. These growing conditions reduced the yield potential of the varieties. There was very little disease pressure or lodging.

Woodville Site

Significant differences in survival ratings were produced with CH8 (99.2%) with the best survival. The range of survival ratings were 99% – 85%.

Several varieties yielded significantly better than the rest, Fundelea (5.5 t/ha) being the highest yielding of this group. Absolvent (78 kg/hl), Century (77 kg/hl), Fundelea (79 kg/hl), Karat (78 kg/hl), and Kastor (77 kg/hl) were demonstrated the highest test weights. Significantly higher thousand kernel weights were produced for Absolvent (39 g/1000), Karat (38.8 g/1000), and M85W7 (38.5 g/1000).

Nappan Site

Significant higher survival ratings occurred in 11 of 14 varieties, ranging from Borden 99% to Zombra 84%. WW8712 (59%), Gawain (56%) and Fresco (36%) had a much lower winter survival.

The varieties Borden (6.6 t/ha), MV15 (6.5 t/ha), Trillium (winter triticale) (5.8 t/ha), and Ruby (5.9 t/ha) yielded significantly better than the other varieties.

Fundelea (79 kg/hl), Karat (79.4 kg/hl), M85W7 (78 kg/hl) and TW1 (79 kg/hl) had the highest test weights. Absolvent (42.8 g/1000) and Karat (43.3 g/1000) had the best thousand kernel weights. Comparison of how each variety performed for yield, thousand kernel weight, and winter survival can be seen from the tables.

CONCLUSION: These trials, which resemble the field conditions of the co-operator, have proved to be a valuable source of data for promising varieties. The growing season certainly stressed the varieties more than in a normal growing year.

Fundelea (5.5 t/ha) was the highest yielding variety at Woodville, while Borden (6.6 t/ha) was the highest yielding variety at Nappan. The range of winter survivals at Woodville was 99% – 85%, while at the Nappan site the ratings were more wide spread from Borden (99%) to Fresco (36%).

ON FARM WINTER WHEAT TRIALS

Woodville, Kings County

Variety	Yield (t/ha)	Test Wt. (kg/hl)	1000 K.Wt. (g/1000)	Winter Survival (%)
Absolvent	4.2 ef	78 a	39.8 a	90 abcd
Borden	4.9 abcde	73 d	31.8 defg	98 ab
Century	5.4 a	77 ab	28.8 g	95 abc
CWW8712	4.5 bcdef	70 e	30.3 efg	89 bcd
Fundelea	5.5 e	79 a	35.0 cd	95 abc
Fresco	4.0 f	72 d	30.0 fg	85 d
Gawain	4.5 bcdef	68 ef	36.0 bc	89 bcd
Karat	4.4 cdef	78 a	38.8 ab	88 cd
Kastor	4.3 def	77 a	32.8 cdef	88 cd
M85W7	4.4 def	74 cd	38.5 ab	94 abcd
MV15	5.0 abcd	72 d	32.0 defg	94 abcd
Trillium[1]	5.2 abc	67 f	33.8 cde	91 abcd
Ruby	5.0 abcd	75 bc	33.0 cdef	96 abc
CH8	4.8 abcdef	73 cd	32.3 cdef	99 a
Zombra (M6-2)	5.3 ab	74 cd	33.0 cdef	94 abcd
LSD.5	0.7	2.1	3.1	7.7

[1] Winter Triticale

Nappan, Cumberland County

Variety	Yield (t/ha)	Test Wt. (kg/hl)	1000 K.Wt. (g/1000)	Winter Survival (%)
Absolvent	4.8 cd	78.1 abc	42.8 a	91 a
Borden	6.6 a	75.8 d	40.5 b	99 a
Century	5.1 cd	77.4 cd	31.5 f	91 a
CWW8712	3.6 e	72.4 e	36.8 de	59 b
Fundelea	5.1 cd	78.8 ab	36.5 de	85 a
Fresco	2.5 f	70.8 f	33.0 f	36 c
Gawain	3.5 ef	67.1 g	38.0 de	56 b
Karat	5.0 cd	79.4 a	38.3 cd	86 a
M85W7	5.3 cd	78.3 abc	43.3 a	93 a
MV15	6.5 ab	77.0 cd	37.3 de	94 a
Trillium[1]	5.8 abc	70.1 f	35.8 e	90 a
Ruby	5.9 abc	79.1 a	40.3 bc	98 a
CH8	5.5 bcd	76.1 d	36.3 de	96 a
Zombra	4.3 de	75.7 d	36.5 de	84 a
LSD.5	1.0	1.5	2.1	

[1] Winter Triticale

ON FARM BARLEY TRIALS

Dwane R. Mellish, P.Ag., Assistant Director, Field Crops
Charles R. Surette, Agricultural Technician

Abstract

Six-row and two-row barleys were evaluated under trial conditions, which closer resemble field conditions of a farmer than small research style plots. The severe hot, very dry growing season, affected the yield potential of the barley. The 2-row barley produced no significant difference for yield ranging from 4.7 t/ha for Lester to 4.2 t/ha for Symko and Hege 292. Etienne (4.5 t/ha) was the highest yielding of the 6-row varieties.

INTRODUCTION: Most variety evaluation is conducted in relatively small plots and are managed by small plot equipment. There is some thought that the evaluation of varieties within a field of wheat with treatments applied by field scale equipment might give a better evaluation of the potential performance of varieties. This approach is used in some European Countries.

A winter wheat on-farm trial incorporating this approach of 1990, provided valuable information and was of interest to farmers and producer groups, so this trial design was extended to barley.

The 2 and 6 row barley trials were seeded next to one another at the farm of John and David Fuller, Kings County, N. S.. The 6-row varieties evaluated were: AB99-13, BT490, Cadette, Chapais, Duke, Etienne, Leger, OB907-37, OB956.13, TBC555-1, QB232.7, Robust, and Sabina. The 2-row varieties included: Albany, FRJN502, FR4933, Hege 292, Hege 747, Helena, Lester, Micmac, Morrison, QB243.13, QB243.83, Rodeo, Symko, and Winthrop. The soil type was a sandy loam.

RESULTS AND DISCUSSION: Weather conditions had a definite detrimental effect on the yield potential of the barley. Most of the growing season to harvest was hot and very dry. Disease pressure was very low and there was no lodging.

2-Row Barley

There was no significant differences in yield among the varieties. Test weights had significant differences, ranging from (69 kg/hl) to (66 kg/hl). Helena (69 kg/hl), FR4064 (69 kg/hl), and Symko (68 kg/hl) had the highest test weight.

6-Row Barley

Unlike the 2-row barley, the 6-row produced significant differences for yield. The highest group included; Etienne (4.5 kg/ha), BT490 (4.4 kg/ha), QB232.7 (4.3 kg/ha), Chapais (4.3 kg/ha), OB907.33 (4.2 kg/ha), and TBC555- 1 (4.2 kg/ha). Cadette was the lowest yielding at (2.9 kg/ha). Higher test weights were produced by Robust (65 kg/hl), Etienne (65 kg/hl), QB232.7 (65 kg/hl), and OB907.33 (65 kg/hl).

CONCLUSION: The hot, very dry weather certainly affected the performance of both barley trials and especially the 2-row barleys, resulting in no differences in yield (a levelling out of varietal yield potential). The six row varieties did demonstrate yield performance differences. Under normal growing season conditions, these trials will provide valuable data on new and promising varieties in a closer to field operation situation. These trials will be continued next year.

6-Row Barley

Variety	Yield (t/ha)	Test Wt. (kg/hl)
AB99-13	4.0 bcd	63 cde
BT490	4.4 ab	61 f
Cadette	2.9 e	62 ef
Chapais	4.3 ab	62 def
Duke	3.8 cd	64 bcd
Etienne	4.5 a	65 ab
Leger	3.7 d	64 bc
OB907.33	4.2 abc	65 abc
OB956.13	3.7 d	63 cde
TBC555-1	4.2 abcd	63 cde
QB232.7	4.3 ab	65 ab
Robust	4.0 bcd	66 a
Sabina	3.8 cd	63 cde
LSD (.5)	.4	1.5

2-Row Barley

Variety	Yield (t/ha)	Test Wt. (kg/hl)
Albany	4.6	67 bcde
FRJN502	4.4	66 ef
FR4064	4.3	69 ab
FR4933	4.3	66 f
Hege 292	4.2	68 bcd
Hege 747	4.5	66 def
Helena	4.4	70 a
Lester	4.7	67 bcde
Micmac	4.3	67 def
Morrison	4.4	68 bcd
QB243.13	4.5	67 cdef
QB243.83	4.2	66 def
Rodeo	4.8	67 cdef
Symko	4.2	68 abc
Winthrop	4.6	66 def
LSD (.5)	.5	1.3

INVERNESS COUNTY BARLEY DEMONSTRATION

Peg Cummings, Crop Specialist
Leo Cox, Agriculture Representative, Inverness County

Abstract

Five barley varieties were seeded in 0.5 ha demonstration plots. Duke, Micmac, and Morrison gave the highest yield.

Five barley varieties were seeded April 26, 1991 with a Vicon Air Seeder in .50 ha blocks at a target seed rate of 140 kg/ha. Dry conditions throughout the growing season affected grain fill and final yield. With the exception of Duke, 2-row varieties outperformed the 6-row varieties, mainly due to their ability to tiller. Comparison of plant population and the number of heads produced per square meter, reflects that the two row varieties Micmac and Morrison did indeed produce a greater number of seed heads which contributed to yield. Surprisingly, Etienne, a top yielder in regional trials, yielded lowest in this demonstration. This may be in part due to establishment on a lower pH soil. Additional lime would not be fully available to correct soil pH until later in the season. Harvest occurred from September 10 – 12 as weather permitted.

Yield rankings were as follows: Duke (3.18 t/ha), Morrison (2.93 t/ha), Micmac (2.78 t/ha), Chapais (2.69 t/ha) and Etienne (2.17 t/ha).

Soil Analysis		Applied
Organic Matter	6.6	8.5 t/ha Lime Spring '91
pH	5.5	422 kg/ha 17-17-17 at seeding
P_2O_5	M -	80 kg/ha 34-0-0 mid June
K_2O	M -	20 g/ha Refine early June
Co-operator	Peter & Janice Wilson Skye Glen	(ZGS 30)

Variety	Actual Seed Rate (kg/ha)	Plants/m^2	Heads/m^2	Yields (t/ha)
Etienne	149	515	509	2.17
Chapais	136	498	559	2.69
Duke	134	418	448	3.18
Micmac	149	404	808	2.78
Morrison	154	502	808	2.93

ANNAPOLIS COUNTY SOIL & CROP DEMONSTRATION SITE TRITICALE DEMONSTRATION

A. John Wilson, Soil and Crop Specialist

Abstract

Certified #2 OAC Trillium was planted September 15, 1990 at 150 kg/ha. Fertiliser was 60 m^3/ha of hog manure in the spring. Growth regulators or herbicides were not used. The crop was harvested late August with a yield of 5 t/ha.

Co-operator: Don Sproule

INTRODUCTION: Triticale is a wheat-rye hybrid cross similar to wheat in energy content and somewhat higher than wheat in protein content. One can expect good results when feeding triticale if it is introduced gradually to replace up to 50% of the grain in livestock diets.

Not all triticales are alike. Old varieties were very susceptible to Ergot and Fusarium. Fusarium can lead to Vomitoxin and Ergot, in itself, is toxic, making the old varieties of triticale a poor feed. Therefore, it is important when growing triticale, to get good quality seed and use land free of couchgrass, and use triticale in a rotation with another crop besides wheat and barley.

MATERIALS AND METHODS:

Crop:	Triticale
Date Planted:	September 15, 1990
Harvest Date:	Late August
Fertilizer:	60 m^3/ha hog manure (spring applied)
Cultivar:	OAC Trillium
Rate:	150 kg/ha

RESULTS AND DISCUSSION: Grain yield is 5.5 t/ha. Although, the yield was affected by drought, it is quite respectable. For lots of cheap grain and straw for on-farm consumption, Trillium is a good bet.

SEPTORIA CONTROL ON WINTER WHEAT (TD 32)

Dwane R. Mellish, P.Ag., Assistant Director, Field Crops
Charles R. Surette, Agricultural Technician

Abstract

A three year study was conducted to assess the impact of varying time of application of both protectant fungicides on the control of septoria leaf and head disease. Septoria disease pressure was very low in 1990 and 1991 and these years showed no differences due to treatment. In 1989, when septoria was present, the best control was accomplished with a combination of systematic protectant fungicides applied at advanced growth stages (ZGS 39 and 57). Final yield was closely related to kernel weight.

INTRODUCTION: Septoria leaf and glume blotch are caused by the same fungus, *Septoria nodorum*. Leaf blotch refers to foliar infections, while glume blotch refers to head infections. Septoria infections of the foliage and head can cause yield reductions, depending on the severity of infections.

Leaf blotch is most critical when the flag leaf, the first leaf below the head, is infected. Early symptoms are small light green to yellow lesions. Usually lesions appear on lower leaves prior to upper leaves. The lesions will enlarge to form large, irregular shaped, light brown to reddish brown blotches, which may have a yellowish margin. Small dark coloured specks, spore producing structures, will usually appear in the centre of maturing lesions. Severely infected leaves will yellow and die prematurely. The fungus can also infect leaf sheaths and stems, especially at nodes, and thus severely reduce the plants resistance to node breakage.

Glume blotch refers to infection of the glumes, or chaff. Early symptoms are small, irregular, light brown lesions on the glumes. With age these lesions enlarge and take on a deeper brown colour. Older lesions are lighter in colour with numerous dark specks, the fungal fruiting bodies. Often, only the upper portion of the head or several glumes are infected. Infected heads may produce shrivelled and lightweight kernels or no kernels.

Karat winter wheat was used to evaluate several fungicides for the control of Septoria when applied at several different ZGS timings. Treatments are listed in Table I.

MATERIALS AND METHODS: This was the third and final year of the trial. A block of Karat winter wheat was treated at the farm of Mr. Eaton, Canning, N.S.. The seeding rate was 400 viable seeds/m^2. Pathways of 2 1/2 m were mowed out and plots of 2 x 6 m were established. The trial design was a randomized complete block design with 4 replicates.

All crop management treatments other than the fungicide program was per the management of the entire wheat field and were applied by the co-operating farmer.

RESULTS AND DISCUSSION: The growing season (1991) had a profound effect on the trial. Much of the growing season was hot and very dry, thus little disease pressure was present. Septoria development and spread depends on moisture, and especially rain to splash the infection to other plants.

No significant differences were produced for yield, test weight, mildew, or septoria ratings.

As in 1991, 1990 produced no differences among the treatments, the result of another exceptionally dry growing season.

In 1989, rainfall during the growing season was less than normal, resulting in low disease pressure but significantly higher than in 1990 or 1991. Nearly all treatments increased yields and thousand kernel weights, as well as reduced septoria levels on the heads. but not all were significantly different from the check. The combination of Tilt/Bravo at ZGS 39 and 57 consistently performed well for all control indicators. The late growth stage treatments (ZGS 57) were most effective in controlling septoria and improving yield, indicating head protection is most important in protecting crop yield. The best results occurred when a combination systemic and protectant program was used following an application at ZGS 31, one notable exception being the combination Tilt/ Bravo at ZGS 39 and ZGS 57.

CONCLUSION: Dry weather during and post heading resulted in low disease pressure in 1991. Due to these conditions no significant responses occurred due to varying the fungicide program.

Similar growing conditions in 1990 also limited responses since only low levels of disease existed. The growing season of 1989 did generate significant levels of septoria. Final yield results closely correlated with kernel weight, indicating the importance of protecting the top leaves and head of the plant when late septoria pressure occurs. With this, disease pattern and application of fungicide at ZGS 39 and 57 are most critical. Late applications which followed an earlier application (ZGS 31) were as good but no better than the late applications alone. Therefore, in years where early septoria pressure is moderate, there is no benefit shown to an early fungicide (ZGS 31) to control septoria inoculum. In a year of heavy early season disease pressure, the result may be different. Wheat fields should be monitored through the season to accurately determine disease pressure.

ACKNOWLEDGEMENT: Funding support of the Can/N.S. Livestock Feed Initiative is greatly appreciated.

1989 RESULTS

Treatment	Rate (gai/ha)	Application (ZGS)	Septoria (head) % (ZGS 80)	TKW (g/1000)	Yield (t/ha)
Check	-	-	9.8 a	43.9 de	7.0 g
Bayleton + Tilt/Bravo	125 + 125/1000	31 + 57	5.1 d	47.1 ab	7.7 abc
Bayleton + Tilt/Dithane	125 + 125/1760	31 + 57	6.9 abcd	47.6 ab	7.8 ab
Tilt/Bravo	125/1000	31	7.0 abcd	43.8 c	7.2 efg
Tilt/Bravo	125/1000	39	7.4 abcd	45.3 be	7.2 fg
Tilt/Bravo	125/1000	57	4.8 d	46.9 ab	7.7 abc
Tilt/Dithane	125/1760	31	9.3 ab	44.4 cde	7.5 bcdef
Tilt/Dithane	125/1760	39	8.7 abc	43.8 e	7.3 defg
Tilt/Dithane	125/1760	57	6.3 bcd	46.2 abcd	7.6 abcde
Tilt	125	31 + 57	6.1 cd	45.5 bcde	7.4 bcdef
Tilt + Tilt/Bravo	125 + 125/1000	31 + 57	5.2 d	47.6 ab	7.9 a
Tilt + Tilt/Dithane	125 + 125/1760	31 + 57	5.2 d	47.0 ab	7.8 abc
Tilt + Tilt	125 + 125	39 + 57	6.9 bcd	46.0 abcde	7.7 abc
Tilt/Bravo + Tilt/Bravo	125/1000 + 125/1000	39 + 57	4.4 d	48.2 a	79 a
Tilt/Dithane + Tilt/Dithane	125/1760 + 125/1760	39 + 57	6.9 bcd	47.0 ab	7.7 abcd
Bravo + Bravo	1000 + 1000	39 + 57	5.5 d	46.3 abc	7.4 cdef
Dithane + Dithane	1760 + 1760	39 + 57	6.9 abcd	47.1 ab	7.5 abcdef
Folicur + Tilt/Bravo	125 + 125/1000	31 + 57	5.8 cd	47.7 ab	7.8 abc
Folicur + Tilt/Dithane	125 + 125/1760	31 + 57	5.3 d	46.0 abcde	7.9 a
Tilt + Tilt/ Bravo/Benelate	125 + 125/ 1000/250	31 + 57	5.0 d	47.2 ab	7.9 a
LSD (0.05)			2.5	2.0	.34

1991 RESULTS

Treatment	Rate (gai/ha)	Application (ZGS)	Test Wt. (kg/hl)	Yield (t/ha)
Check	-	-	76	4.2
Bayleton + Tilt/Bravo	125 + 125/1000	31 + 57	76	4.7
Bayleton + Tilt/Dithane	125 + 125/1760	31 + 57	75	3.8
Tilt/Bravo	125/1000	31	76	4.2
Tilt/Bravo	125/1000	39	76	4.7
Tilt/Bravo	125/1000	57	77	5.0
Tilt/Dithane	125/1760	31	76	4.2
Tilt/Dithane	125/1760	39	76	4.4
Tilt/Dithane	125/1760	57	75	4.3
Tilt	125	31 + 57	76	4.6
Tilt + Tilt/Bravo	125 + 125/1000	31 + 57	75	4.5
Tilt + Tilt/Dithane	125 + 125/1760	31 + 57	76	4.8
Tilt + Tilt	125 + 125	39 + 57	78	5.1
Tilt/Bravo + Tilt/Bravo	125/1000 + 125/1000	39 + 57	76	4.5
Tilt/Dithane + Tilt/Dithane	125/1760 + 125/1760	39 + 57	77	5.2
Bravo + Bravo	1000 + 1000	39 + 57	76	4.5
Dithane + Dithane	1760 + 1760	39 + 57	75	3.9
Folicur + Tilt/Bravo	125 + 125/1000	31 + 57	76	4.6
Folicur + Tilt/Dithane	125 + 125/1760	31 + 57	76	4.3
Tilt + Tilt/ Bravo/Benelate	125 + 125/ 1000/250	31 + 57	75	4.2
LSD (0.05)			n.s.	n.s.

BARLEY TOLERANCE TO HERBICIDES AT THREE GROWTH STAGES ALFI PROJECT # TT93

D.J. Doohan, Ph.D., Supervisor, Weed Science Services
Sharon Campbell, Weed Project Co-ordinator

Abstract

Herbicides were applied to Chapais barley at three growth stages: Zadok 13 (3 leaf); Zadok 23 (3 tillers); and Zadok 32 (2 nodes). Crop injury ratings were recorded one week after application and at monthly intervals throughout the growing season. Treatments applied at Zadok 32 reduces crop height and yield.

INTRODUCTION: Annually, producers experience injury to their grain crops from broadleaf herbicides. Examples of herbicide injuries are leaf crinkling, scorched leaf tips, stunting of height and reduced tillering (Lemerle 1984). A decreased crop yield may also result from herbicide injury. LeBlanc (1989-1990) indicated many broadleaf herbicides for grain reduced yields when applied at Zadok 32 (2 node stage) and little or no effect on yield with application at Zadok 12-14 (2-4 leaf stage). The objective of this study was to evaluate the influence of time of herbicide application on crop tolerance.

MATERIALS AND METHODS: Chapais barley was seeded May 11, 1991 at Habitant, Kings County. Soil was a Truro 84 type. Seven commonly used herbicides were applied at Zadok growth stages 13, 23, and 32 in a split plot treatment design. Spray was applied in 200 l/ha volume at 230 kpa pressure, using a hand-held CO_2 sprayer. The herbicides used were MCPA, 2,4-D, Target, Dyvel, Buctril M, Ultim and Kilmor. Weed free controls for each timing (growth stage) were weeded by hand at the same time as the herbicides were applied. After the initial weeding, these treatments were maintained weed free.

Crop injury ratings were recorded one week after application and at monthly intervals throughout the growing season. Barley was harvested August 15, 1991.

RESULTS AND DISCUSSION: The highest yields were obtained from application at Zadok 13 of Kilmor, Dyvel, Buctril M, and Ultim. Target applied at this stage reduced yields. Previous data (LeBlanc 1989, 1990) reported favourable yields with Target applied at Zadok 12. This may suggest Target is detrimental to barley yields if applied after the 2 leaf stage.

Yields declined remarkably with subsequent application timings in all herbicide treatments except MCPA and 2,4-D. This finding corroborates previous reports by LeBlanc (1989, 1990). Therefore timing of MCPA and 2,4-D application for crop tolerance may not be as crucial as for other broadleaf herbicides.

Crop injury from herbicide application at Zadok 23 and 32 appears indicative of yield reduction.

CONCLUSION: These results and those of LeBlanc (1989, 1990) indicate that barley tolerance to several herbicides decreases as the crop progresses from Zadok 12 to Zadok 32. Herbicides that consist of mixtures of growth regulators (eg. Target, Dyvel) may cause injury leading to decreased yields. MCPA and 2,4-D appear to be relatively safe to the crop across the growth stages investigated in this study.

Additional research should investigate efficacy of Target and Dyvel when used at Zadok 12.

ACKNOWLEDGEMENTS: This project was supported by the Canada/Nova Scotia Livestock Feed Initiative. Thanks to John and Dave Fuller for cropland use.

Table 1: Barley Yields (t/ha) from herbicide applied at 3 growth stages.

Treatment	Kg ai/ha	Zadok 13	Zadok 23	Zadok 32
Weed free	-	3.8	3.5	3.5
Weedy	-	2.6	2.6	2.5
MCPA	0.85	3.4	3.6	3.2
2,4-D	0.85	3.8	3.8	3.6
Target	0.60	2.7	2.3	1.1
Dyvel	0.50	3.0	2.3	1.4
Buctril M	0.56	3.1	2.9	2.7
Ultim + Agral 90	0.015 + 0.2%	3.6	2.9	2.5
Ultim + Agral 90	0.0075 + 0.2%	3.2	3.0	2.9
Kilmor	0.53	3.4	2.0	1.5
LSD (0.05)		0.19	0.19	0.19

Table 2: Crop Injury Assessments (%)

	Zadok 13 Rating #			*Zadok 23* Rating #			*Zadok 32* Rating #		
Treatment	1	2	3	1	2	3	1	2	3
Weed free	0	0	0	0	0	0	0	0	-
Weedy	0	0	0	0	0	0	0	0	-
MCPA	5	0	0	0	0	0	5	0	-
2,4-D	0	0	0	0	0	0	0	0	-
Target	15	0	5	5	5	15	0	25	-
Dyvel	10	0	0	5	20	25	5	30	-
Buctril M	10	0	0	0	0	5	0	0	-
Ultim 0.15+Agral 90 0.2%	30	0	0	5	0	0	0	0	-
Ultim 0.0075+Agral 90 0.2%	30	0	0	10	0	0	0	0	-
Kilmor	10	0	20	5	5	25	5	30	-

FALL HERBICIDE TREATMENT IN WINTER WHEAT FOR SCENTLESS CHAMOMILE CONTROL

D.J. Doohan, Ph.D., Supervisor, Weed Science Services
Sharon Campbell, Weed Project Coordinator

Abstract

Herbicides were applied to Borden winter wheat on October 21, 1990 at Zadok 22 and 4 - 6 leaf stage of scentless chamomile. Crop injury ratings were done one week after application. Plant counts were done on scentless chamomile at the time of spraying and in the spring of 1990. The herbicides used: Refine, Target, Kilmor, MCPA, Buctril M, Dyvel, and Ultim, all demonstrated effective weed control of scentless chamomile. Plot yields indicated no significant differences between treatments.

INTRODUCTION: Scentless chamomile infestation is increasing in Nova Scotia grain fields. It is an annual germinating in the spring or fall. Few herbicides are registered for fall application to winter cereals.

The purpose of this trial was to screen herbicides used on spring cereals that may have the potential to offer effective weed control and not injure crops if applied in the fall on winter cereals.

MATERIALS AND METHODS: Borden winter wheat was planted at Hastings, Cumberland County on Sept. 9, 1990. Refine, Target, Kilmor, MCPA, Buctril M, Dyvel, and Ultim were applied on October 21, 1990. Crop stage was Zadok 22 and scentless chamomile had 4 - 6 leaves. Experimental design was a randomized complete block with 4 replications. Plots were 2m x 4m. Herbicides were applied with a hand held CO_2 sprayer. Water volume was 200 l/ha at 230 kpa pressure. Weed counts were done just prior to spraying and crop injury was evaluated one week later. A weed count was recorded the next spring and weed control evaluations were done at monthly intervals during the 1991 growing season. Harvest was done August 14, 1991.

RESULTS AND DISCUSSION: Herbicides evaluated were selected from previous screening trials. Results were consistent with previous data as to control measured by diminishing plant (weed) numbers of fall germinated populations. Visual ratings suggest MCPA demonstrated to poorest control of scentless chamomile. Buctril M offered the best control.

Yields were not different between the weedy control and herbicide treatments. A prolonged drought during the growing season may have altered yield results.

CONCLUSION: Of the herbicides tested, Buctril M is the only chemical registered for fall application on winter cereals. This herbicide appears to offer good control of fall germinating scentless chamomile.

Other herbicides screened have the potential to be effective herbicides for winter cereals upon future registration for this use.

ACKNOWLEDGEMENTS: This project was supported by the Canada/Nova Scotia Livestock Feed Initiative. Thanks to Philip and Larry Pederson for cropland use.

Results of Fall Applied Herbicides to Winter Wheat for Scentless Chamomile Control

Treatment	Kg ai/ha	Crop Tolerance	*Fall Germinating Scentless Chamomile Plant Counts(m^2)* Oct/90	May/91	*Scentless Chamomile Control (%)* June/91	July/91	Yields t/ha
Control	-	-	109	79	0	0	2.9
Refine+Agral 90	0.0075+0.2%	10	81	5	70	90	3.8
Refine+Agral 90	0.015+0.2%	5	104	8	70	80	3.3
Target	0.60	10	89	4	70	80	3.2
Kilmor	0.53	15	65	4	70	80	2.8
MCPA	0.80	0	66	6	50	60	3.0
Buctril M	0.56	0	57	3	80	90	3.3
Dyvel	0.50	10	74	9	70	80	3.2
Ultim+Agral 90	0.0075+0.2%	0	79	34	60	70	3.1
Ultim+Agral 90	0.015+0.2%	5	68	2	80	80	3.3
LSD (0.05)							0.413*

* No significant difference

COMPARISON OF VARIOUS NUTRIENT PROGRAMS ON BARLEY YIELD

Jack van Roestel, P.Ag., Crops Extension Specialist

Abstract

Livestock manures have a valuable role to play in providing a source of Nitrogen, Phosphorous, and Potassium for crop production. Predicting the soil nutrient contribution, time of release, and residual nutrient amounts from previous manure applications is much more difficult than with commercial granular fertilisers. Nevertheless, to achieve Maximum Economic Yields (M.E.Y.'s) and limit groundwater pollution, producers need to accurately budget for the nutrient contributions from all sources.

In 1991, a comparison of the plant tissue and soil analysis levels, along with yield checks on two barley varieties, grown under three nutrient programs was studied. The results from the cattle manure (@ 24 t/ha), poultry litter (@ 16 t/ha) and granular fertiliser (17-17-17 @ 300 kg/ha) treatments, however, were inconclusive. This was due to problems during manure application and the very high inherent soil fertility at this site based on previous manure application history and crop rotation.

INTRODUCTION: Manure composition and soil nutrient release from various nutrient sources cause difficulties in fertility budgeting, due to numerous complicating factors. Manure composition is affected by a number of factors including; type and age of livestock, livestock diet, method of manure handling and storage, extent of slurry dilution, type of bedding material, etc.. Soil nutrient release is determined by manure composition, plus various soil factors such as temperature, pH, moisture, texture, C:N ratio, microbial activity, just to name a few.

MATERIAL AND METHODS: Two barley varieties, Chapais and Morrison, were each grown on three, non-replicated 2500 m^2 treatment areas (25 m x 100 m). The nutrient treatments administered randomly to these strips were, cattle manure (24 t/ha), hen litter (16 t/ha), and commercial fertilizer (17-17-17 @ 300 kg/ha). The semi-composted (2–4 month old) cattle manure, hen litter, and fertilizer were applied and incorporated immediately, just prior to seeding. The 16 t/ha poultry manure rate was twice the desired amount (8 t/ha) because of problems in the speed adjustment of the spreader being used. The barley was seeded at 125 kg/ha, herbicide was applied when needed.

A complete soil nutrient, plant tissue sampling, and analysis was conducted throughout the growing season. Grain yields were measured by harvesting the entire treatment area with a conventional combine, and using axle load scales, measuring wheel, and moisture meter.

RESULTS AND DISCUSSION: After having done an extensive sampling for soil and plant nutrient levels throughout the growing season, culminating with yield measurements, it was disappointing to not observe any conclusive trend or results in the data.

The soil nitrate levels (nitrate -N kg/ha) were very high for all treatments during the Zadoks Growth Stages 21 and 31. At Growth Stage 57 (75% head emergence) the soil nitrate levels dropped considerably for the cattle and fertilizer treatments, but remained high for the hen litter, suggesting the latter fertility source released more gradually over the growing season (see Table 1).

Table 1
Soil Nitrate - N (kg/ha) Levels present at Various Intervals* in 1991

Treatment	At Seeding	G.S. 21	G.S. 31	G.S. 59	G.S. 92
Cow Manure (24 t/ha)	160	243	202	131	21
Hen Litter (16 t/ha)	104	250	252	290	27
17-17-17 (300 kg/ha)	127	163	248	72	21
Cow Manure (24 t/ha)	105	127	141	43	26
Hen Litter (16 t/ha)	85	213	294	210	30
17-17-17 (300 kg/ha)	128	195	248	51	30

* Zadoks Growth Stages: G.S.21 (main shoot & 1 tiller), G.S. 31 (1st (node detectable), G.S. 57 (75% head emerged), G.S. 92 (ripe kernel).

The tissue analysis for various macro and micronutrients showed no real differences for the three treatments during various growth stages (this data is available upon request).

Lastly, yield differences were inconclusive, which can be attributed to extreme drought conditions, site variability, and the high inherent soil fertility which was mentioned previously.

Table 2
Barley Yields for Various Nutrient Programs
Sheffield Mills, Kings County – 1991

Treatment	Chapais Yield (t/ha)	Morrison Yield (t/ha)
Cow Manure (24 t/ha)	4.1	2.1
Hen Litter (16 t/ha)	3.2	2.1
Fert. (17-17-17 @ 300 kg/ha)	2.9	2.9

CONCLUSION: Due to the complexity and importance of soil nutrient management for manures and other organic sources, further regional studies are urgently required to provide more guidance to producers during these competitive times.

ACKNOWLEDGEMENTS: Thanks to Wilmar Acres Ltd., Mark Butcher, Kings County Soil and Crop Improvement Association, and the Provincial Soil and Feed Analysis Lab for their contributions to this project.

EVALUATION OF A COMBINE GRAIN STRIPPING HEADER (A.L.F.I. # TT152)

Jack van Roestel, P.Ag., Crops Extension Specialist

Abstract

In 1991, the Fullers' of Blomidon, Kings County, conducted a performance comparison of the newly developed grain stripping head versus the conventional pick-up reel header on a Case-IH combine. These farmers were able to increase harvesting capacity by over 60% with the 4.2 meter stripper header, compared to the conventional 4.5m pick-up reel, albeit grain losses were slightly higher with Rodeo barley (2.3 vs. 1.4%) but still far below on the tolerable 5% limit. It was also impressive to see that only 10 minutes was required to switch heads on the Case-IH 1640 axial flow combine.

INTRODUCTION: The August-November cereal harvest period is a very hectic time in Kings County. Farmers, or custom operators are scrambling to harvest cereals before serious fungal head diseases or unfavourable weather conditions lead to significant quality deterioration and yield losses.

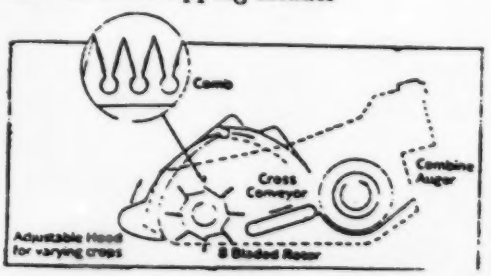
Combine harvest capacity and field losses are a real problem, both on the individual farm and in intensive production areas. Most combines presently used here are American Midwest made, and don't have the threshing or separation capacity internally to properly handle our usual 5–8 t/ha grain crops (plus heavy straw amounts). Thus, many farmers end up paying 15–20% of total production costs for custom combining and are still realizing harvest losses of 5–30% in barley and wheat.

The grain stripping head manufactured by Shelbourne Reynolds Engineering in Suffolk Co., England and evaluated by A.D.A.S., looks like an excellent "header" that could improve on present combine inadequacies.

The grain stripper consists of (see enclosed company literature):

- adjustable crop deflector to suit varying crop heights
- 8–row plastic tooth, stripping rotor with variable speed adjustments (300 – 1,000 r.p.m.'s)
- adjustable skids for all conditions
- self-tensioning, endless plastic conveyor belt to main auger
- torque limiter, overrun clutch, crop dividers, and "lifting eyes"

Figure 1. Diagram of a British Grain Stripping Header



MATERIALS AND METHODS: The harvest capacity and field yield measurements for the 4.2 meter stripper header vs. the 4.5 meter conventional pick-up reel were taken from random two (2) hectare blocks in the large Rodeo barley field. A stop watch, axle load scales, land measuring wheel, and moisture meter were used to measure grain harvested by the Case-IH Combine. Small quadrants (0.25 m^2) were used to measure grain losses as per recognize procedure (i.e. University of Illinois pamphlet, Measuring Small Grain Losses).

RESULTS AND DISCUSSION: British farmers using this header since 1987 have increased harvest speed on barley, wheat, and linseed by 40–100%, without experiencing increased crop losses. Results with peas and canola haven't been as favourable.

In our comparison, the Fullers were able to increase harvesting capacity by over 60% with the 4.2 meter stripper header, compared to the conventional 4.5 m pick-up reel, albeit grain losses were slightly higher with Rodeo barley (2.3 vs. 1.4%) but still far below the tolerable 5% limit (see Table 1).

Table 1

Stripper Header Evaluation on Rodeo Barley
Blomidon, Kings County, N.S. – 1991

	Yield (t/ha)	Grain Losses	Harvest Capacity
Stripper Head	3.5	2.3%	3.4 ha/hr
Conv. Head	3.5	1.4%	2.1 ha/hr

The stripper head leaves 80–90% of the grain straw standing in the field. If the straw is not going to be incorporated, it needs to be mowed and put in a windrow for baling.

During use of the stripper head over the fall harvest period, the combine operator made the following observations...(1) this header worked great in lodged crops and it didn't matter what direction you went into the grain; (2) the header is very easy to lubricate and take off in five minutes (Fullers have made transport wagons to disconnect the header onto); (3) the stripper head is very easy to operate at high travelling speeds; and (4) slight modification had to be made around the feeding auger and viewing slot on the header, to stop some grain loss at these points.

CONCLUSION: The Fullers' are very impressed with the performance of the stripper header in barley and wheat. Further comparison work between the two types of headers, especially on soybeans, will be conducted in 1992.

ACKNOWLEDGEMENT: The financial assistance provided by A.L.F.I. and the efforts of John and David Fuller are greatly appreciated.

EVALUATION OF A "GRIP TRAC KIT" ON A JOHN DEERE COMBINE (A.L.F.I. # TT146)

Jack van Roestel, P.Ag., Crops Extension Specialist

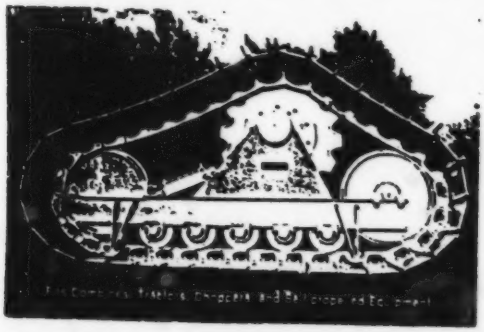
Abstract

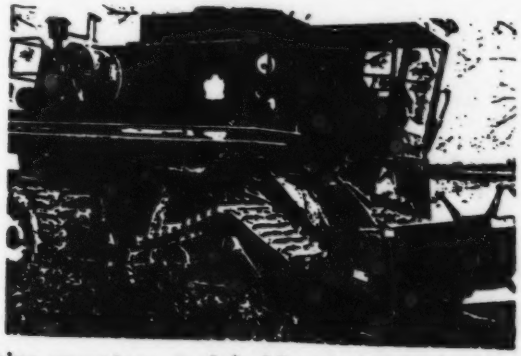
During the wet fall of 1991, the Aylesford Machinery Co-op found it necessary to use the combine tracks on over 300 hectares (750 ac.) of grain corn and a few soybeans. The U.S. manufactured half-tracks, properly propelled the 4-row corn combine over saturated soils where the crop could not have been taken off with conventional equipment.
The "Grip Tracs" kept the combine from sliding off the corn row, increased harvesting speed on wet land, and reduced both fuel consumption and soil compaction (i.e. bulk density at 15 cm. soil depth of 1.35 vs. 1.55 g/cm^3) that occurred when rubber tires were used under the same conditions.

INTRODUCTION: During the September–November grain and corn harvest period in Nova Scotia, field conditions can often be very wet and thus cause significant crop losses, serious soil compaction/rutting, or inhibit harvesting entirely. In 1988 and again in 1991, very wet field conditions did occur at harvest, producing all the above mentioned consequences. Fortunately, for grain corn growers especially, there are now four harvesters in this province (i.e. 2 combines and 2 self-propelled snapper machines) that can take off crops on saturated soils.

The "Grip Tracs" pictured below, replace the front tires of the combine, giving the machine more flotation and better traction on wetter soils. The back side of the "Grip Trac" drive sprocket is machined out to fit over the hub of the final drive. The double set of mounting holes and adaptor ring assures versatility on many machines.

Figure 1 & 2: Aylesford Machinery Co-op's Combine Tracks





MATERIALS AND METHODS: The combine operators, mainly Mannie Lewis, kept a log of the hectarage harvested with these tracks (i.e. both co-op members and custom work), along with harvesting observations.

The soil bulk density (compaction) and moisture measurements were taken with a CPN neutron–porta probe owned by Agriculture Canada, Soils Unit, Truro.

RESULTS AND DISCUSSION: The combine operator was very pleased with the performance of the tracks on saturated soils. The tracks enabled the combine to travel straight on the corn rows, averaging a 1.1 hectare/hour, harvesting speed on wet land. This harvesting

capacity is similar to the speed that this combine can achieve with rubber tires on dry soil conditions.

The combine half-tracs minimized the soil compaction and rutting on the field (see Table 1), compared to the front-mounted, rubber tires on wet land. However, all is not perfect with the tracks, because the rear wheels still contribute to some compaction and degradation, albeit to a much lesser extent than if the tracks weren't used.

Table 1

Soil Moisture and Compaction Measurements at Harvest
Waterville, Kings County, N.S. – 1991*

Sample Depth (cm)	Treatment	Soil Moisture (%)	Bulk Density (g/cm^3)
5	Rubber tires (front)	48	1.53
5	Rubber tires (rear)	44	1.44
5	Grip Tracs	44	1.34
5	Non-harvested area	42	1.30
15	Rubber tires (front)	48	1.55
15	Rubber tires (rear)	46	1.49
15	Grip tracs	45	1.35
15	Non-harvested area	42	1.32

*The accuracy of bulk density measurements maybe impaired by high soil moisture conditions.

With over 200 hectares of custom work done with the tracks on the corn combine, I've enclosed a comment from one of the Aylesford Machinery Co-op's satisfied customers.....

> *"Without the tracks, we could not have harvested our grain corn in 1991. The combine travelled easily over heavy land where I couldn't even walk."*
>
> *B. Mazner, Martock, Hants County*

CONCLUSIONS: The combine tracks don't make any money for the producers during dry years, however, are an "insurance policy" during the wet years for the Co-op members and a custom clientele to avoid soil degradation, crop losses and insurance claims.

ACKNOWLEDGEMENTS: The financial assistance from A.L.F.I., soil compaction measurements from Delmar Holstrom, Agriculture Canada, and the corn harvesting observations by M. Lewis were greatly appreciated in conducting this project.

EVALUATION OF A WINDROW INVERTER TO IMPROVE WILTING SPEED AND FORAGE QUALITY (A.L.F.I. # TT165)

Jack van Roestel, P.Ag., Crops Extension Specialist

Abstract

A two-year evaluation began in June, 1990 to study the effect of using a Ford-New Holland Hay Inverter on the wilting speed and nutrient quality of forages. The hay inverter worked well on 160 ha. (400 acres) in both hay and haylage situations, after minor equipment modifications were made. Inversion of single windrows containing a 3.7 m (12 ft.) swath, on the next morning after mowing (approximately 24 hours later), hastened wilting speed from 10–43% on the inverted vs. non-inverted forage in a three-hour period between inversion and harvesting. In 1991, the hay inverter was used on a very limited acreage because of extreme dry conditions for 1st and 2nd cuts.

INTRODUCTION: Traditional practice on the co-operators farm near Berwick, has utilized an early three-cut haylage and hay program. Generally, the first cut starts around May 25th, with good tonnages of quality alfalfa/grass based mixtures moved off the fields quickly and stored predominantly in upright silos.

We believe that the hay inverter should increase the quality of early cut haylage, by enhancing the wilting of heavy windrows produced by the 3.7 m (12 ft.) disc mower-conditioner, especially during the late May-early June time period when drying conditions are not that intense. Harvesting the crop more quickly after mowing, generally reduces the respiration loss in the windrow (i.e. amount of nutrients used up by respiring plant cells/ bacteria) and lessens the risk of weather losses.

The hay inverter should also be helpful in making hay, where the windrow can be gently flipped over after partial wilting on top, and with the valuable leaves kept mostly intact, compared to the harsh action of a tedder.

MATERIAL AND METHOD: The hay inverter was evaluated on three forage fields in 1990. Inversion of windrows produced by a 3.7 m (12 ft.) disc mower-conditioner took place on the next morning after the dew had dried off (approximately 24 hours after mowing). Adjacent "test windrows" with one inverted and non-inverted treatments were sampled for moisture content and nutrient analysis at harvesting (approx. 3 hours after windrow inversion). These samples were quickly frozen and then delivered to the provincial feed testing lab at a later date for analysis.

RESULTS AND DISCUSSION: Preliminary evaluation of this Ford-New Holland implement indicates that windrow inversion about 24 hours after mowing can greatly hasten the wilting speed of forages in just a three hour period between inversion and harvesting.

Table 1

Effect of Hay Inversion on Wilting Speed & Forage Quality, Weston, Kings County, 1990.

Type of Forage	% Harvest Moisture	% Protein	% T.D.N.
1st cut alfalfa/ grass - inverted	43.1	N.A.	59.9
1st cut alfalfa/ grass - non-inverted	49.0	N.A.	68.2
2nd cut grass - inverted	31.0	16.7	67.0
2nd cut grass - non inverted	60.4	16.9	64.2
2nd cut alfalfa/ grass - inverted	23.9	19.3	70.4
2nd cut alfalfa/ grass - non inverted	50.3	15.7	64.1

With the extremely rapid drying conditions during both summers, the windrow inversion hastened wilting too much in situations where the forage was being harvested as haylage. However, the accelerated drying rate that is possible through windrow inversion will be very beneficial in both hay and haylage making situations during less than ideal wilting conditions.

The operator, however, would like to see a bit heavier and wider design to the windrow inverter. The implement is too light for use on over 200 hectares/year and not wide enough to properly double up windrows from a 3.6 meter (12 ft.) disc mower-conditioner. A minor modification to improve the chain tightener and the addition of a guard to prevent crop winding on the drive chain were necessary to improve the performance of this machine.

CONCLUSIONS: From preliminary evaluation of the inverter, it seems this machine can substantially increase forage crop dry down (wilting) by gently flipping the windrow. The inverter was used on either single windrows or to double or tripling up windrows for quicker harvesting, by flipping one windrow onto the next.

ACKNOWLEDGEMENTS: The financial assistance from A.L.F.I. and the field evaluation work by G. Fulton was greatly appreciated in this project.

EVALUATION OF A TWIN ROTOR TILLER AND ROLLER HARROW ON DYKELAND AND UPLAND SOILS (A.L.F.I. # TT199)

Jack vanRoestel, P.Ag., Crops Extension Specialist

Abstract

A two-year study commenced in 1991, to evaluate the soil tillage-crop yield performance achieved on both heavy dykeland and upland soil types from a twin rotor tiller and roller harrow finishing implements, within various tillage systems. Considerable tractor time, fuel savings, and equal or better yields resulted from the use of these new tillage implements versus the previously used tillage systems.

INTRODUCTION: The Round Hill Machinery Co-op members crop over 200 hectares (500 acres) of which 50% of this is generally tilled annually for spring grain, corn, and new seeded forages. Unfortunately, the majority of this area contains heavy clay-loam dykeland and upland soils which presents particular tillage problems such as: – 1) requirement for extra tillage passes; 2) lumpy or very fluffy seedbed conditions; 3) greater potential for soil crusting; and 4) the tendency for too deep a seed placement or planter skips, all resulting in reduced crop emergence and yields.

These tillage problems are common to many other farmers in this province, particularly those managing a fair acreage of dykeland. To date, there has not been a specific tillage system identified by the Department/farming community that produces the most optimal seedbed and soil conditions on dykeland. This project was designed to evaluate how specialized secondary tillage implements such as the twin rotor tiller and roller harrow can improve crop yields and reduce fuel costs and soil degradation on these heavy soil types.

MATERIALS AND METHODS: In 1991, two initial tillage trials were conducted on the farms of A. Bishop and D. Sproule, Round Hill, Annapolis County. This non-replicated demonstration had a treatment area of 1-1.5 hectares. Tillage treatments consisted of:

A. Bishop

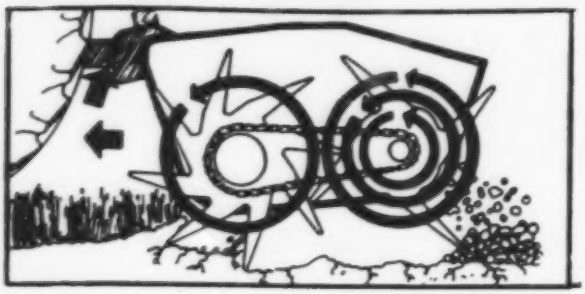
1. Old Tillage System
   - spring moldboard plowed
   - 2 passes offset disc
   - 1 pass spr. tooth harrow
   - post plant rolling

2. New Tillage System
   - Spring moldboard plowed
   - 1 pass Dyna-Drive
   - 1 pass roller harrow
   - post plant rolling with roller harrow

D. & M. Sproule

1. Old Tillage System
   - 2 spring passes offset disc
   - 2 passes with spr. tooth harrow
   - post plant-rolling small roller

2. New Tillage System
   - 1 spr. pass offset disc
   - 1 pass roller harrow
   - post plant - rolling with roller harrow



The Dyna-Drive is a very uncomplicated twin rotor ground driven tillage tool that has no PTO or gearbox. The Dyna-Drive's front rotor is geared directly to the ground and drives the rear rotor with a heavy duty roller chain arrangement. Speed differential between the two creates a unique lifting and breaking action in the soil that provides a superior tilth

Figure 1. Manufacturers Diagram & Comments on Dyna-Drive Tiller

On both fields, a crop of Chapais 6-row barley was grown. Grain yields were taken from a representative 0.3-hectare strips using a conventional combine, axle load scales, land measuring wheel, and a moisture meter.

RESULTS AND DISCUSSION: At A. Bishop's farm, yields were similar with a harvest of 3.4 and 3.5 tonnes/hectare for the old and new tillage systems, respectively. However, considerable savings in fuel and time was realized in using the new Dyna-Drive twin rotor tiller (see Figure 1) and roller harrow.

The Dyna-Drive was used on about 40 hectares of A. Bishop's farm in 1991. It worked well for new forage seeding, with the Dyna Drive creating an optimum seedbed on old ryegrass sod with no plowing and just two passes of the ground driven tiller. Mr. Bishop made these initial years comments about the Dyna-Drive;

- The Dyna-Drive does not bring up sod on plowed ground because of only operating at a 2–4" depth.
- Dyna-Drive is easy to maintain with no p.t.o., but requires 100 H.P. tractor to operate at 3–4 acres/hour.
- Having both the Dyna-Drive and Roller Harrow implements in the machinery, Co-op allows the three (3) members to work various pieces of ground at the same time (i.e. on grain stubble ground the offset disc and roller harrows were used and on forage ground, the plow and Dyna-Drive tiller).

At D. & M. Sproule's farm, treatment yields were higher for the new tillage system (4.1 t/ha) versus the old tillage approach (3.3 t/ha).

D. Sproule made the following statement about the roller harrow;

> *"The roller harrow compared to our old tillage system saved 70 hours of spring tractor time on our 186 acres (75 ha.), and produced an extra 1/3 ton per acre of barley. These results will allow for a quick payback on this harrow."*

CONCLUSION: The initial year's experience with both the Dyna-Drive tiller and roller harrow in 1991 was very encouraging. Further testing with these tillage implements within various tillage systems will be conducted in 1992.

ACKNOWLEDGEMENT: The financial assistance from A.L.F.I. and the efforts of Andy Bishop, Don, and Marc Sproule was greatly appreciated!